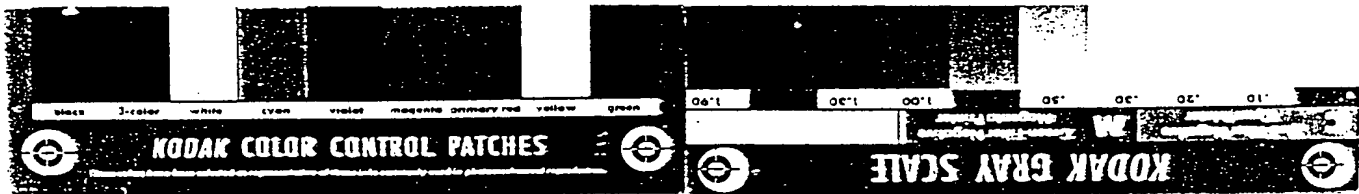


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Fig. 1

Color comparison of various passive layers



Substrate: Zinc-plated screws

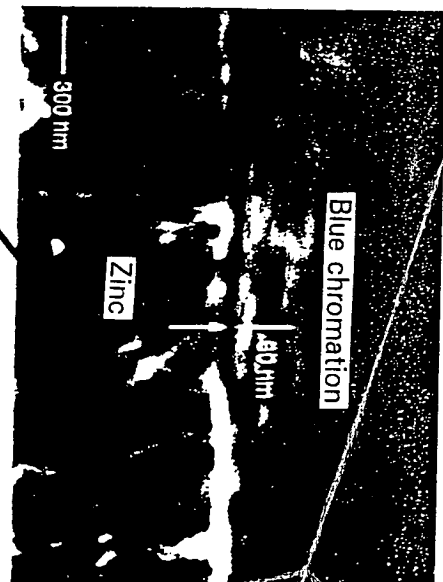
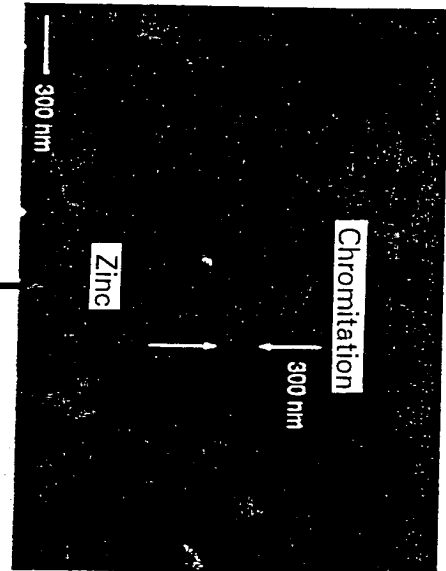
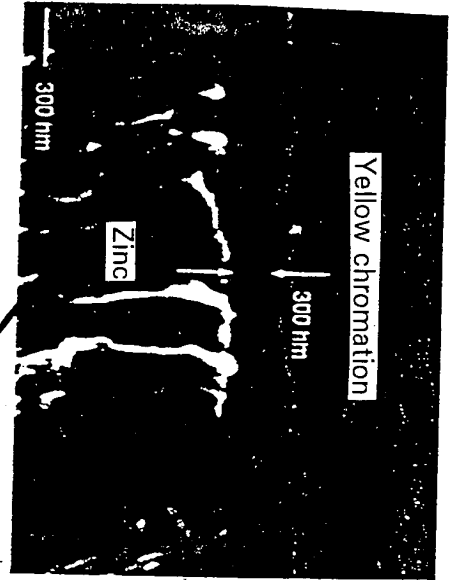
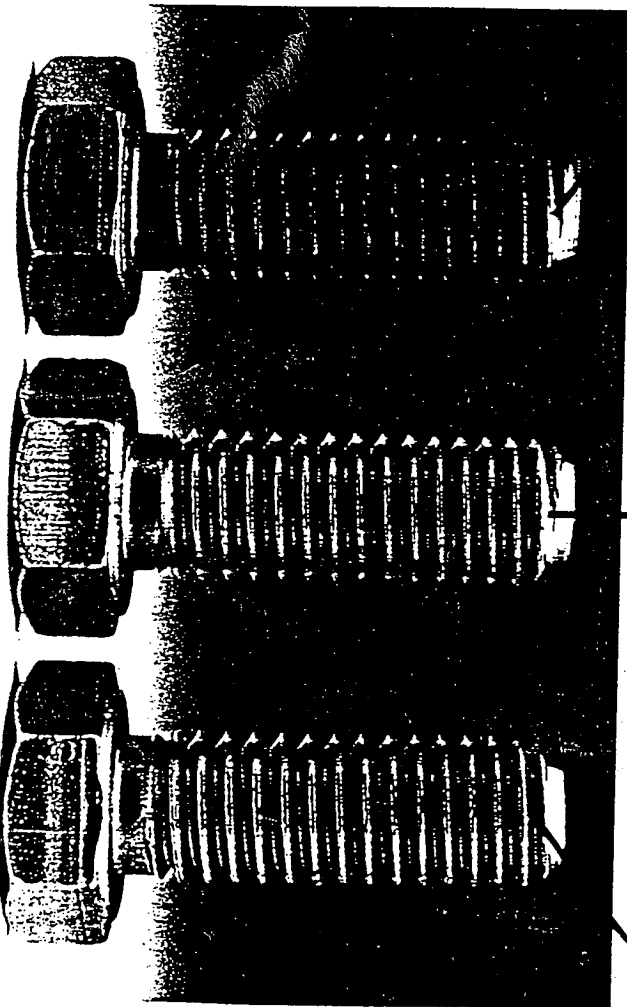
Blue chromation: Left picture half

Invention: Center

Yellow chromation: Right picture half

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FIG. 2

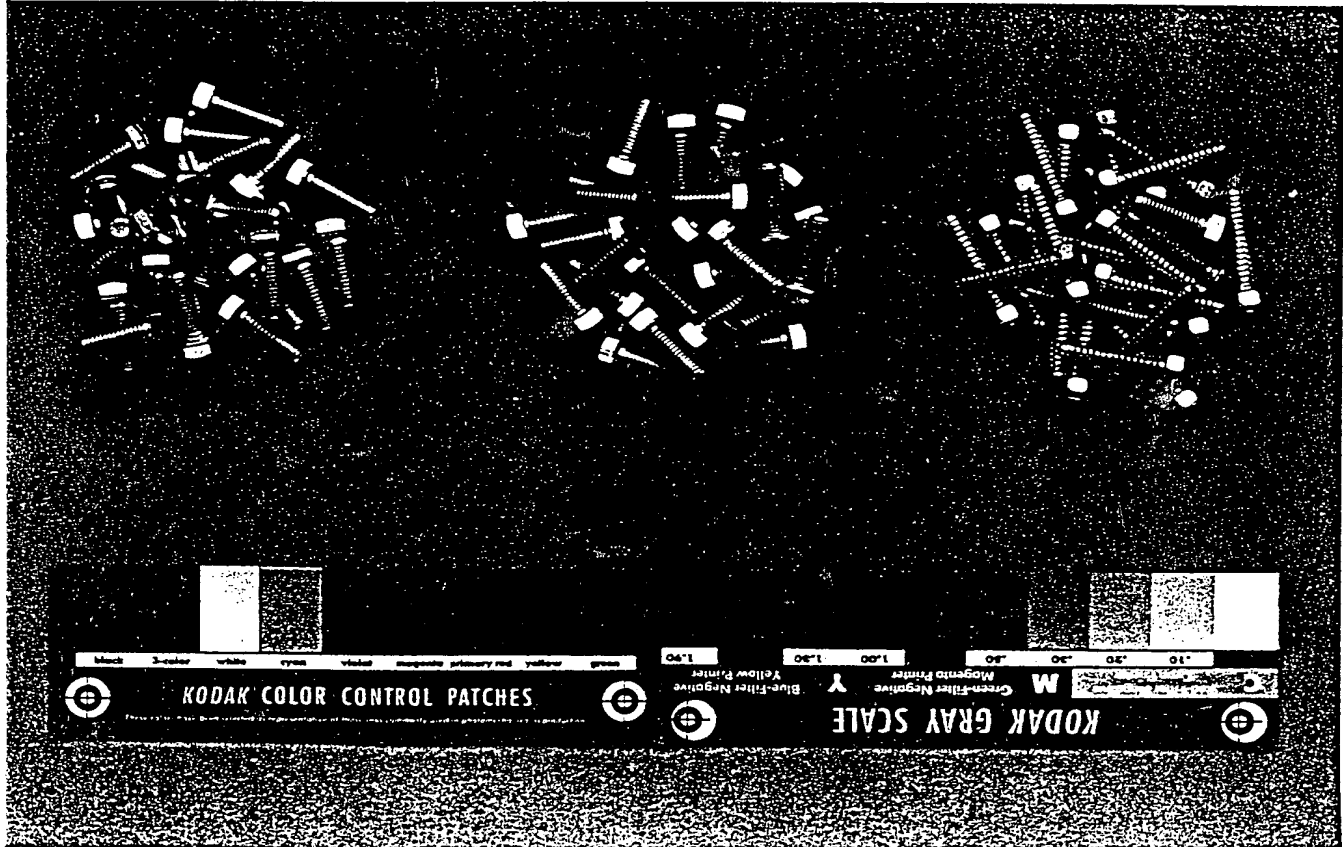


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Fig. 3

Bandwidth of iridescence according to the present invention
(on zinc-plated screws)



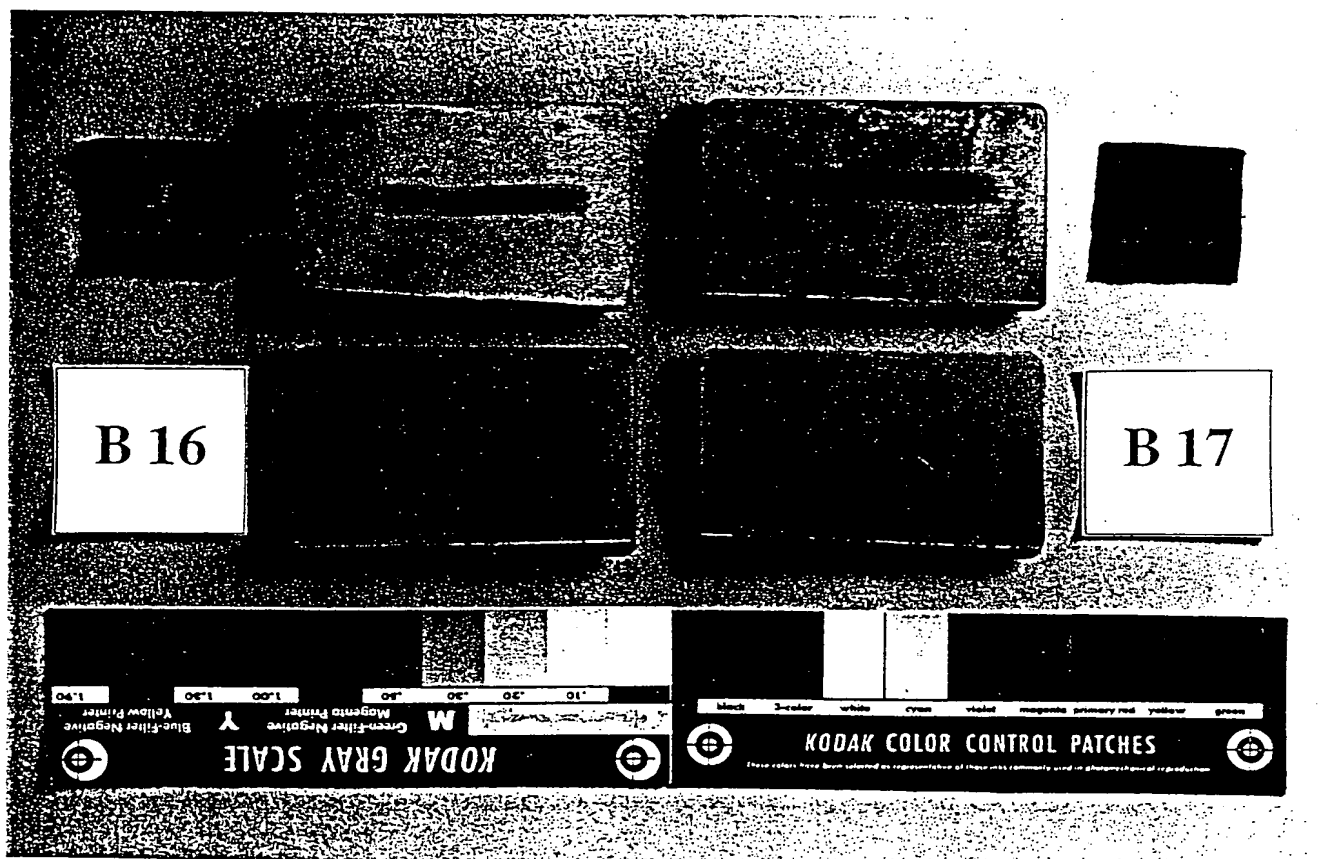
09171558-032000

Fig. 4

Comparison test with EP 0 034 040

Example 16

Example 17



The upper picture half, one the outer left and right, shows a black cloth whereby the abrasions on the metal sheets shown in the top picture half were obtained. Layer portions - discernible as whitish stains - are on both pieces of cloth. The lower picture half shows the unmarred layers of the prior art.

Substrate: Zinc-plated steel sheet.

FIG. 5

Pattern 1, Measurement Position A

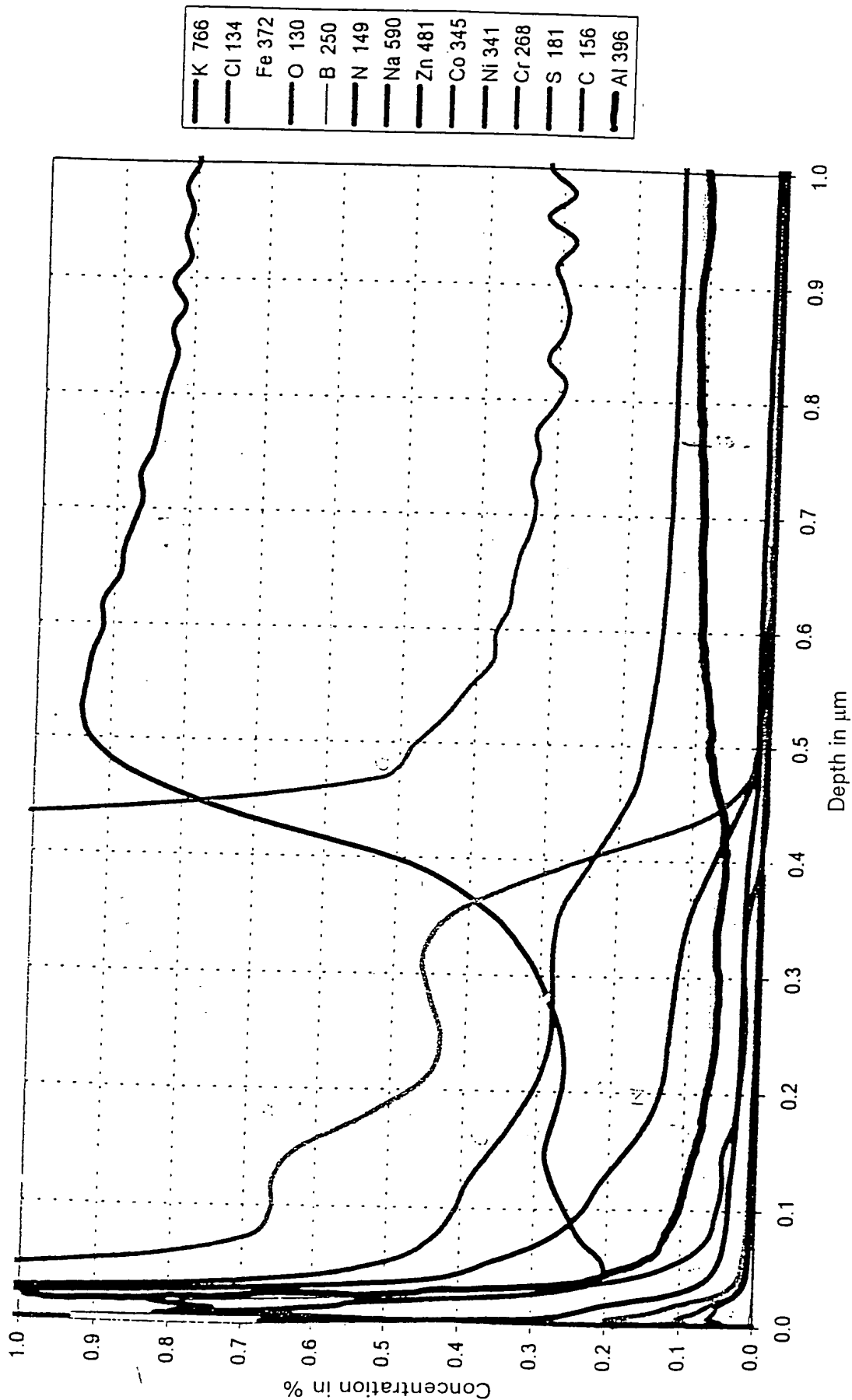


Diagram 2

Pattern 1, Measurement Position A

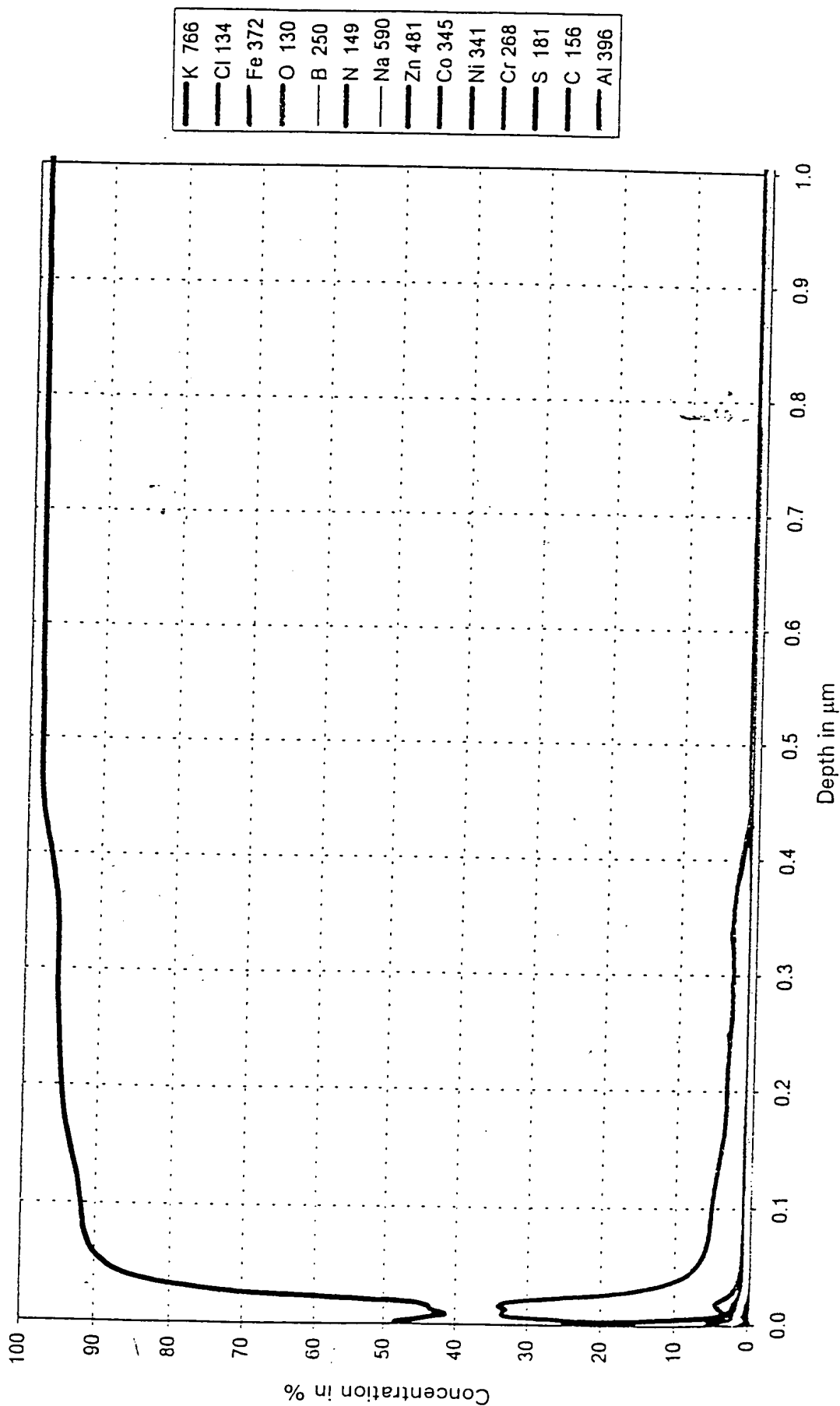
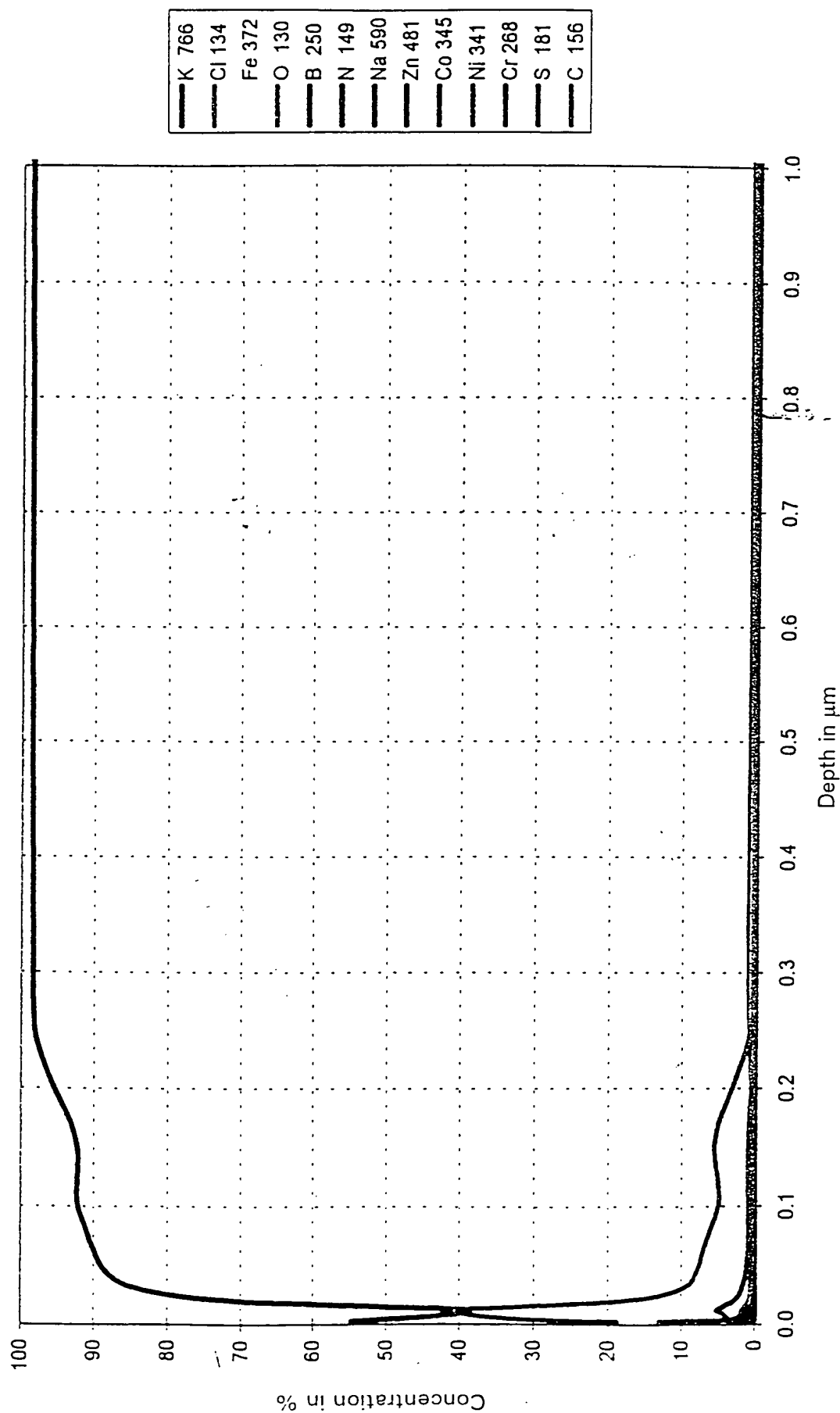


Diagram 1
66020 8591260

Sample 1, Measurement Position B



66620-8957260

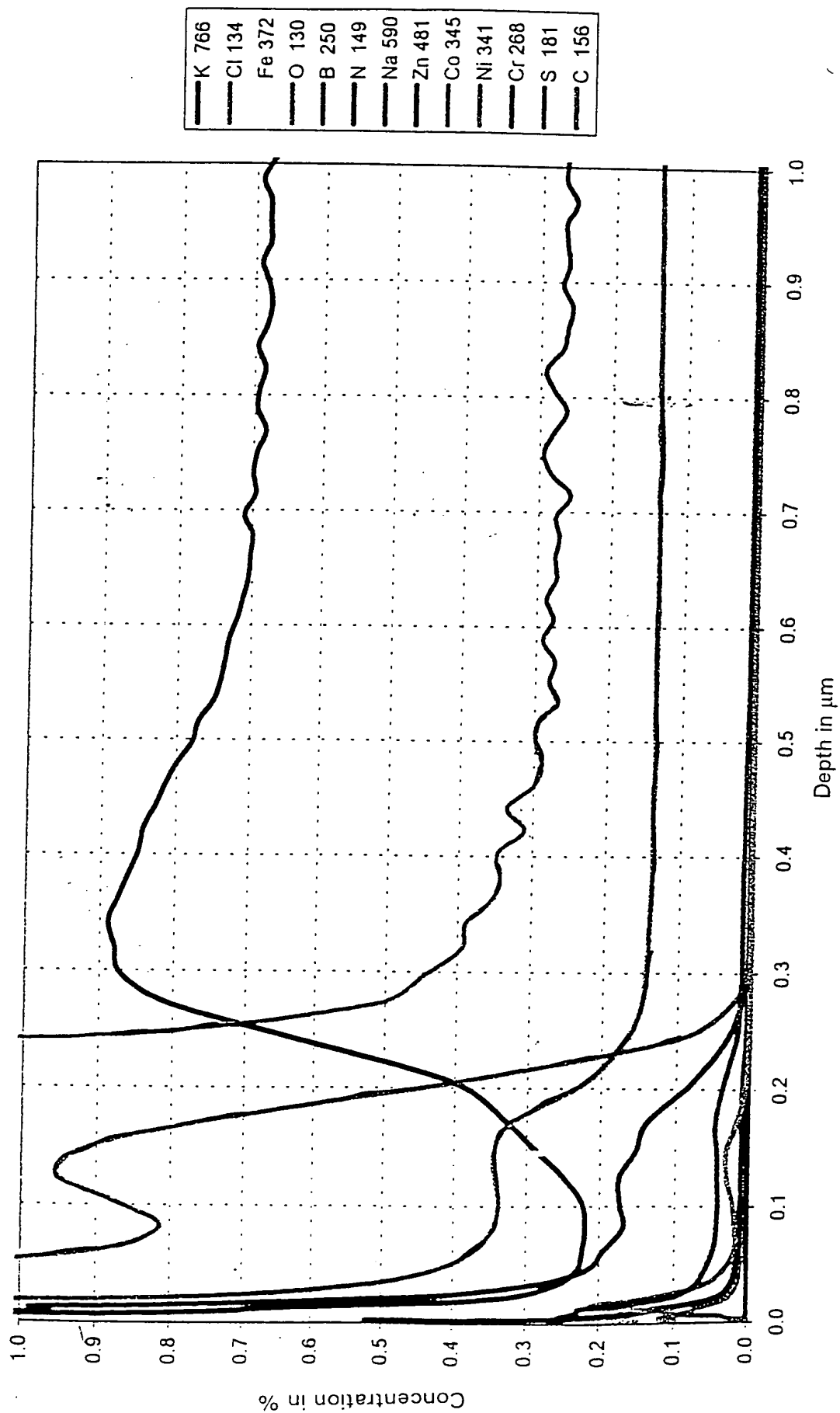
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FIG. 8

Diagram 2

Sample 1, Measurement Position B



00000 8551260

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—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

Sample 2, Measurement Position A

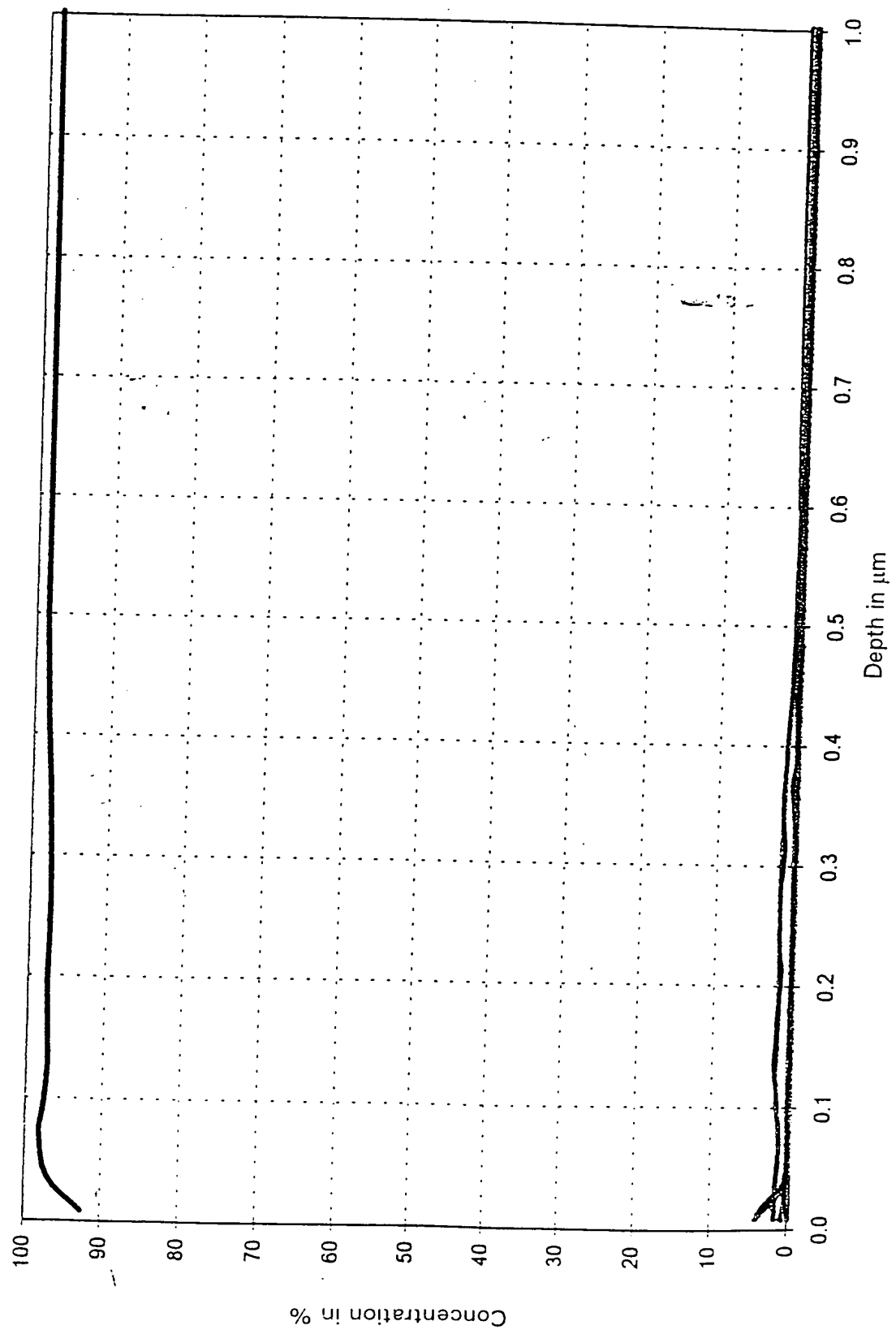


Diagram 1

FIG. 9

000000 05512100

Diagram 2

Sample 2, Measurement Position A

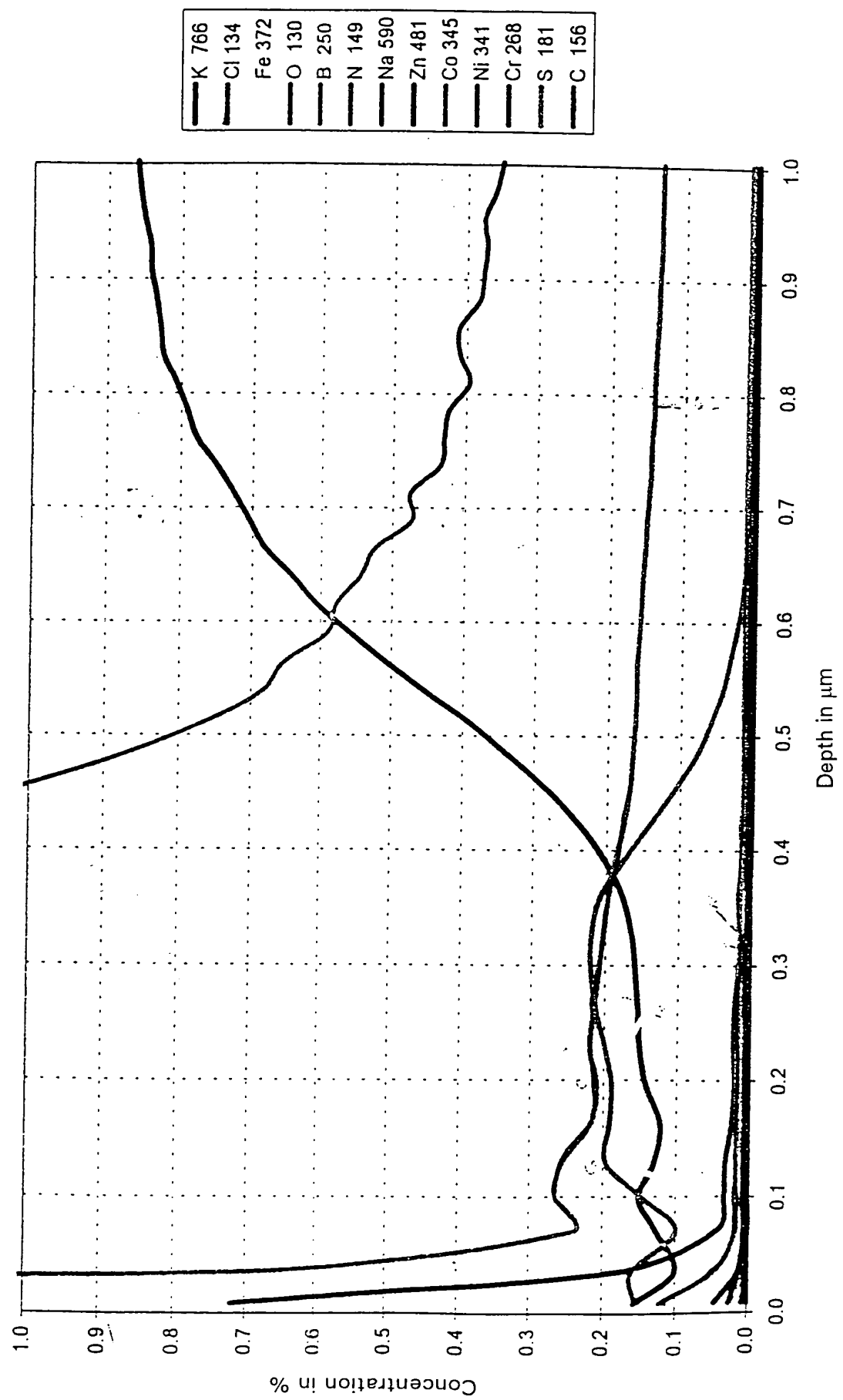


Diagram 1

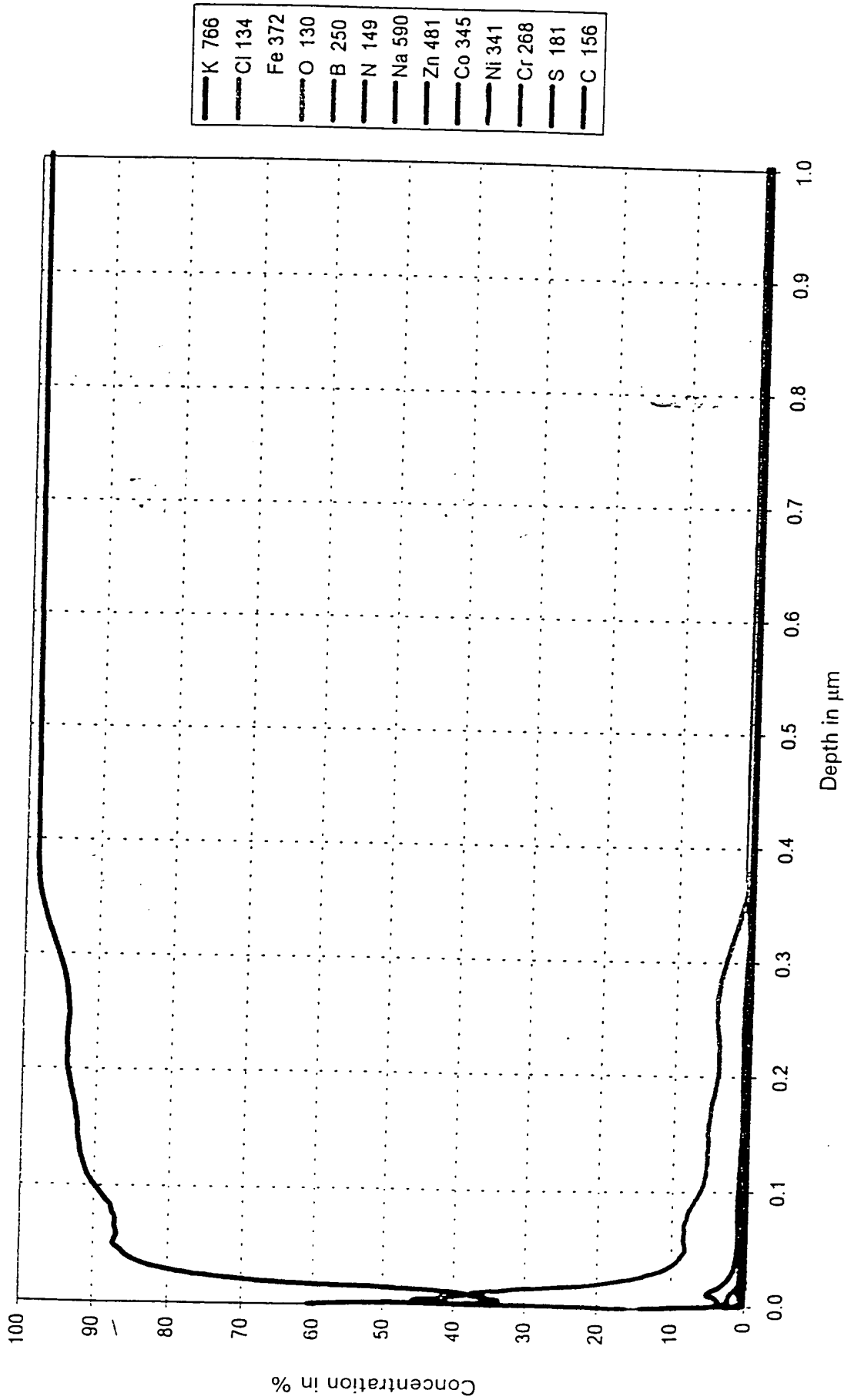
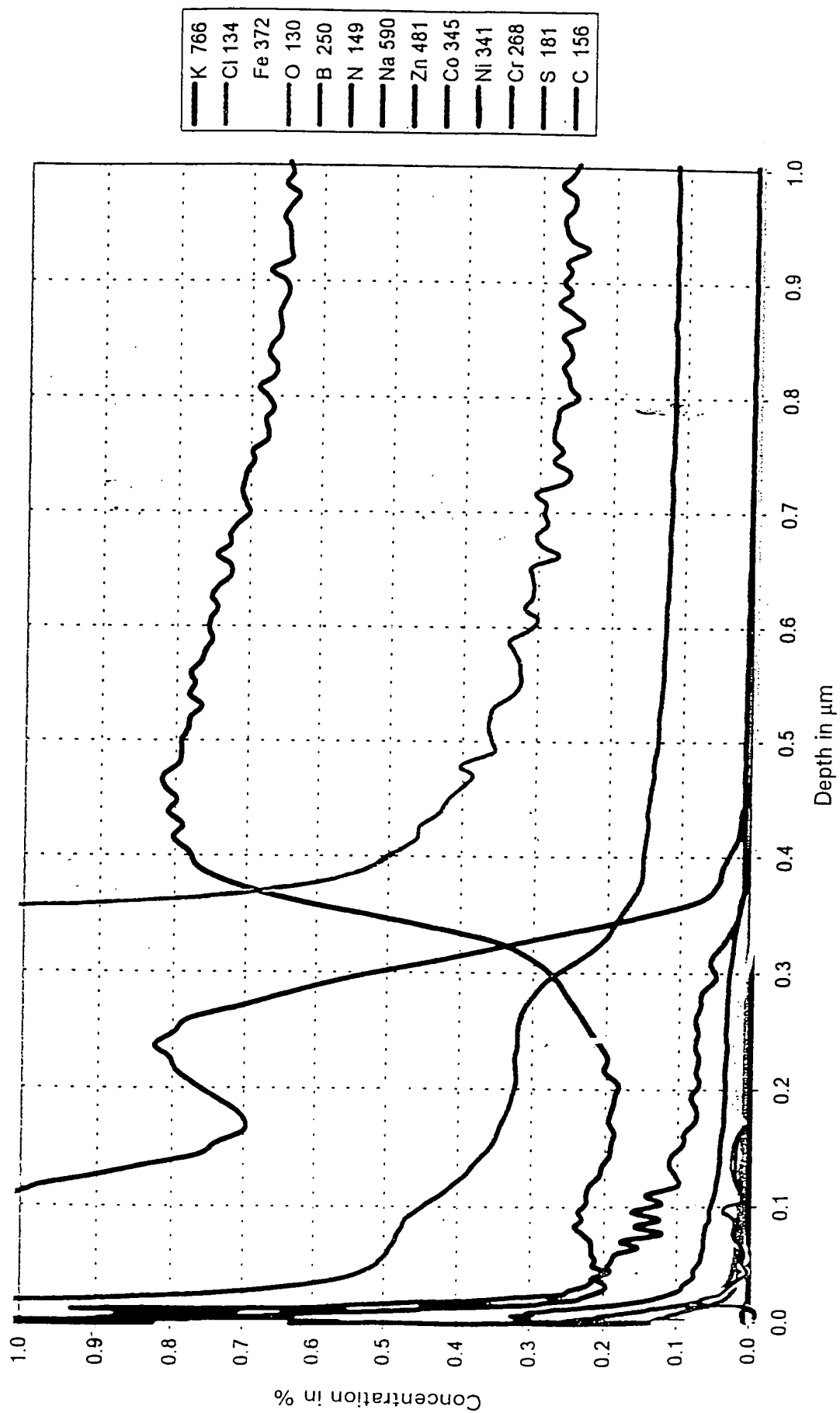
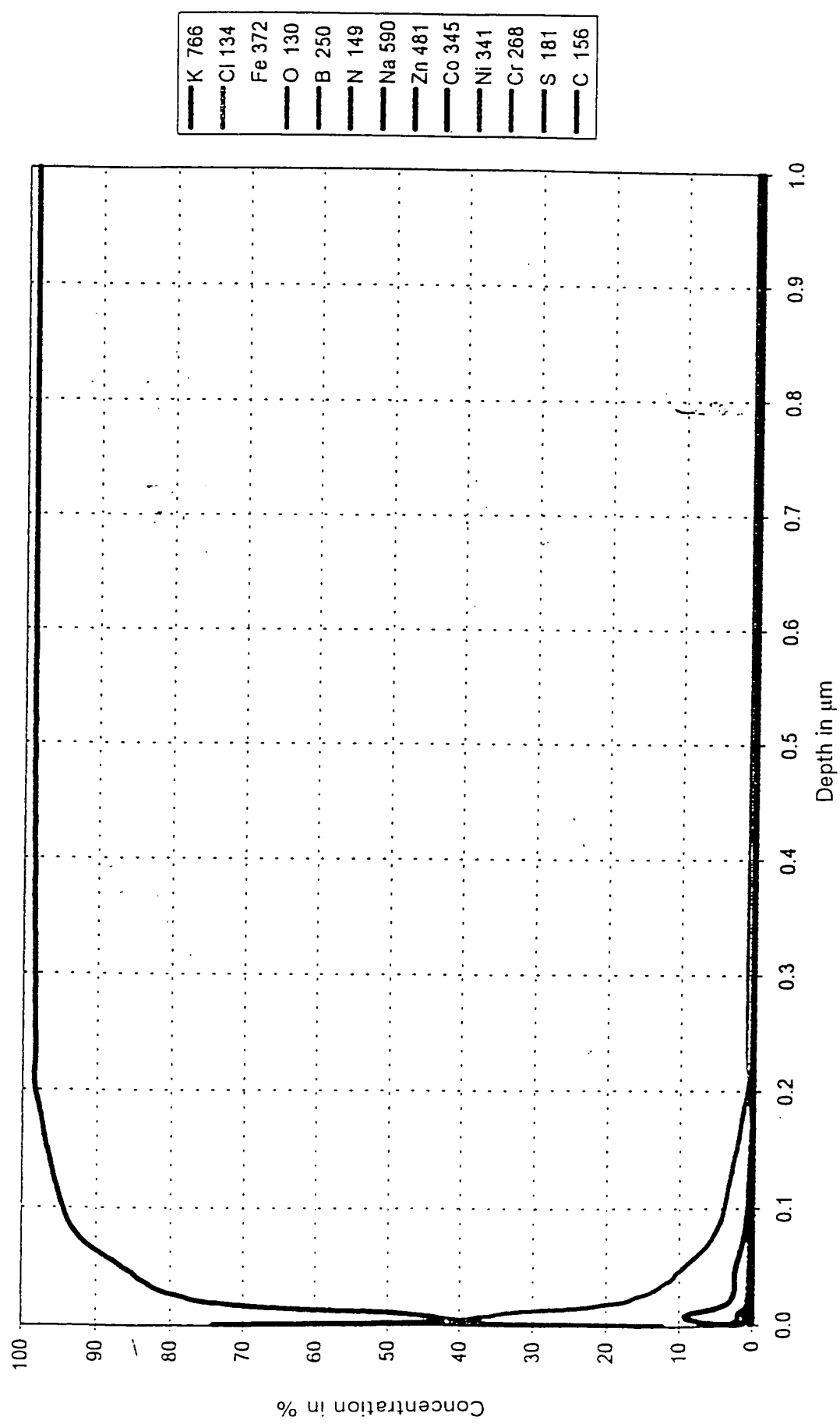


Diagram 2

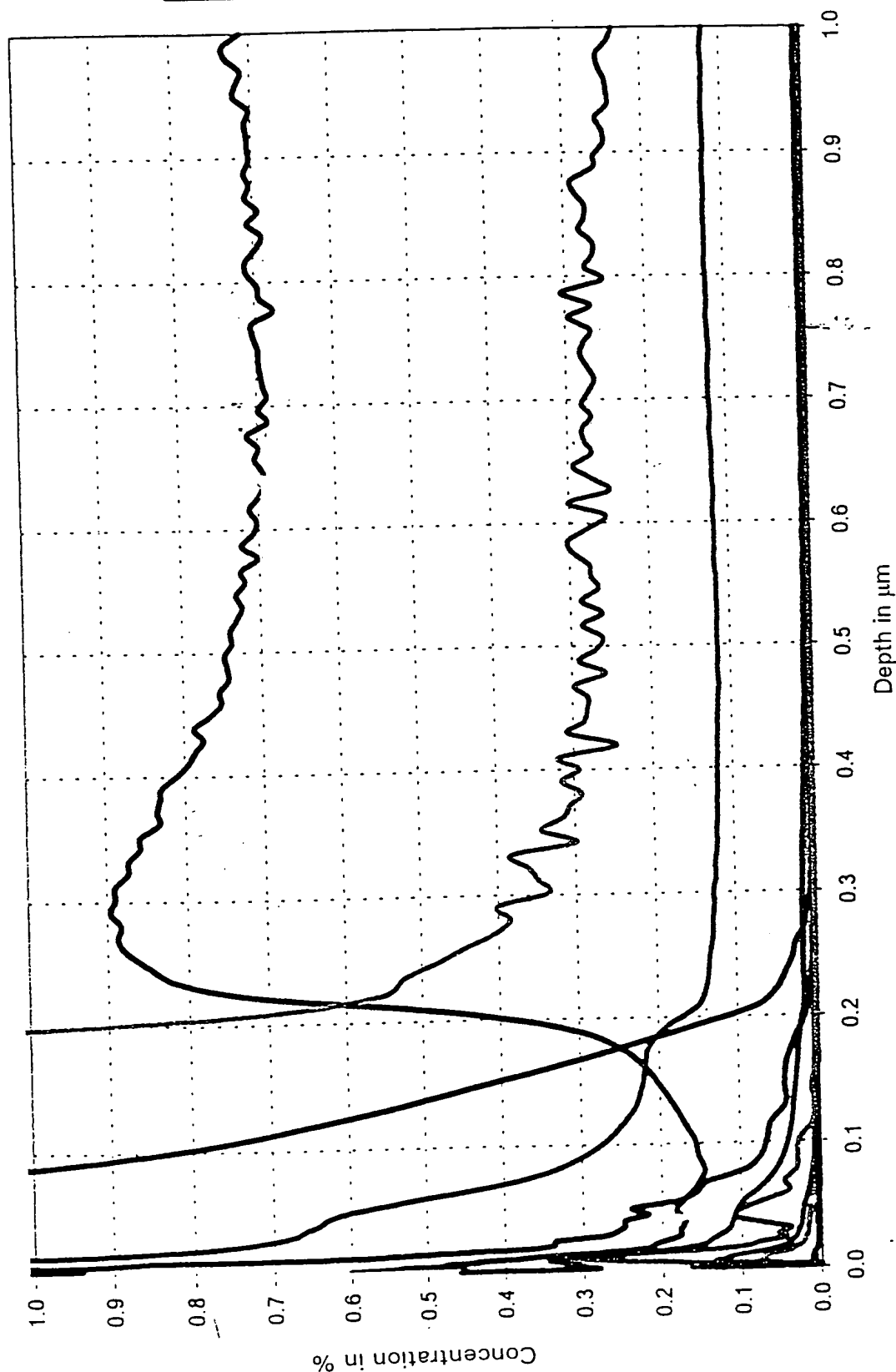
Sample 2, Measurement Position B



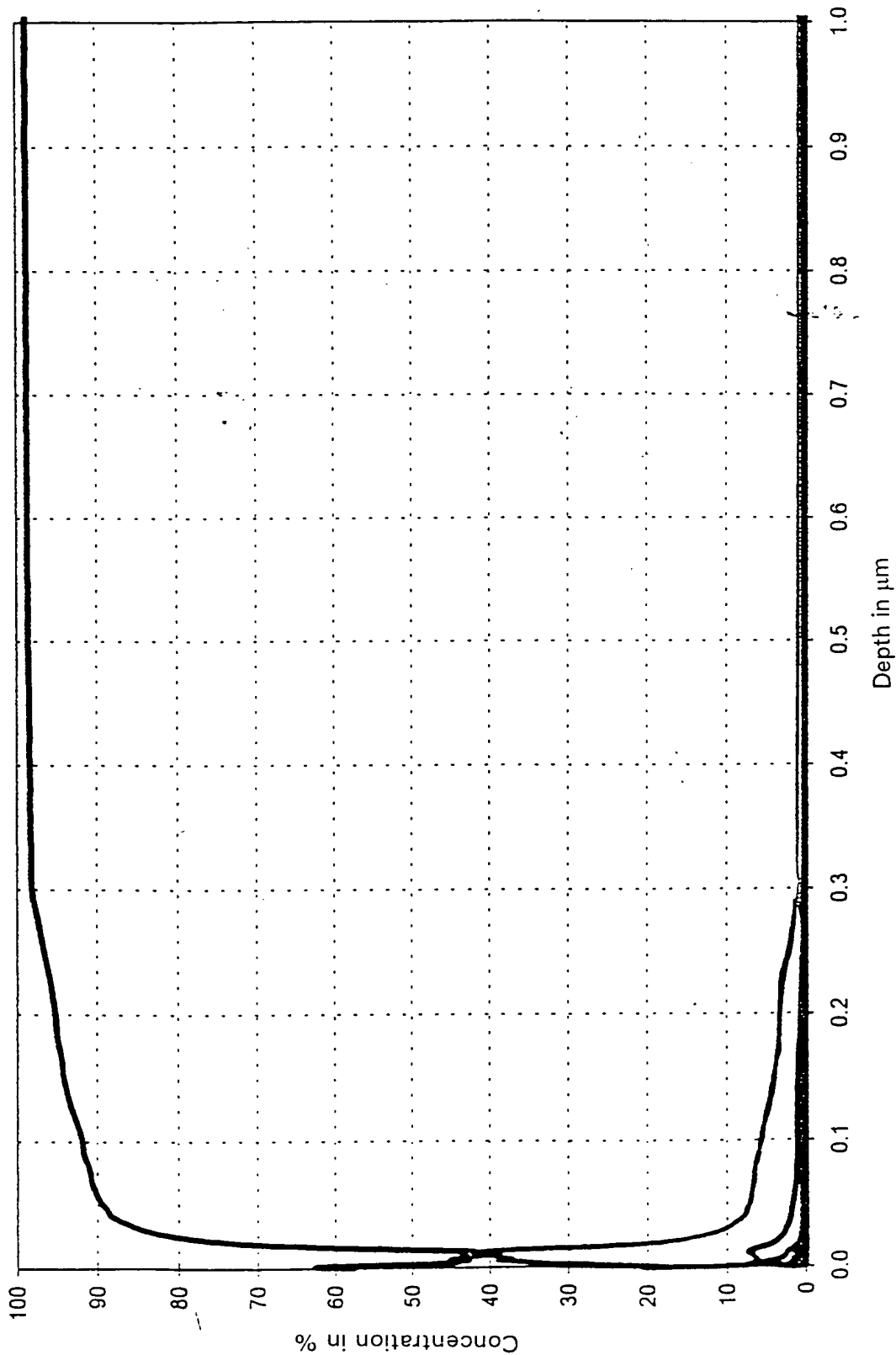
Sample 3, Measurement Position A



Sample 3, Measurement Position A



Sample 4, Measurement Position A



—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

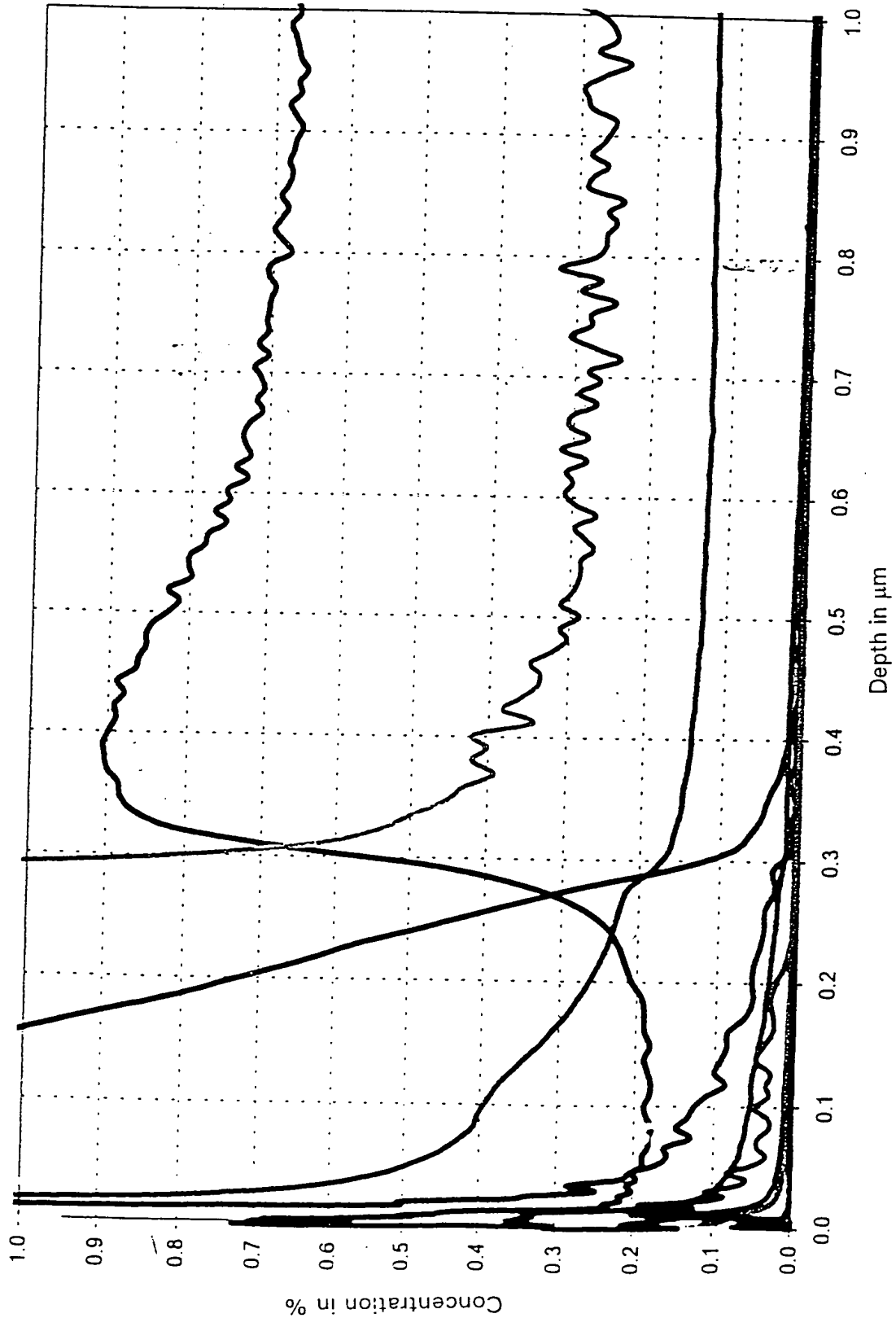
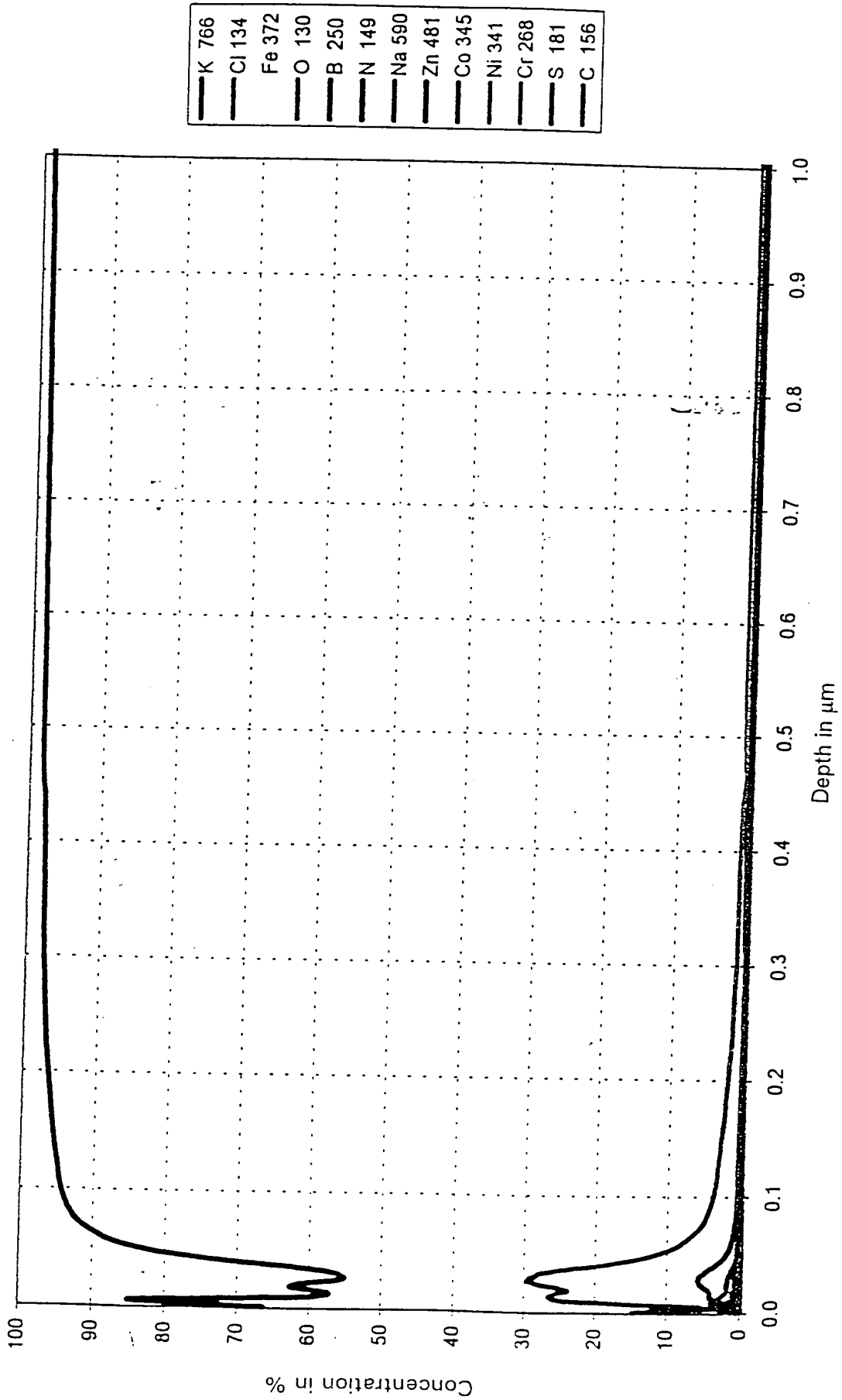


FIG. 16

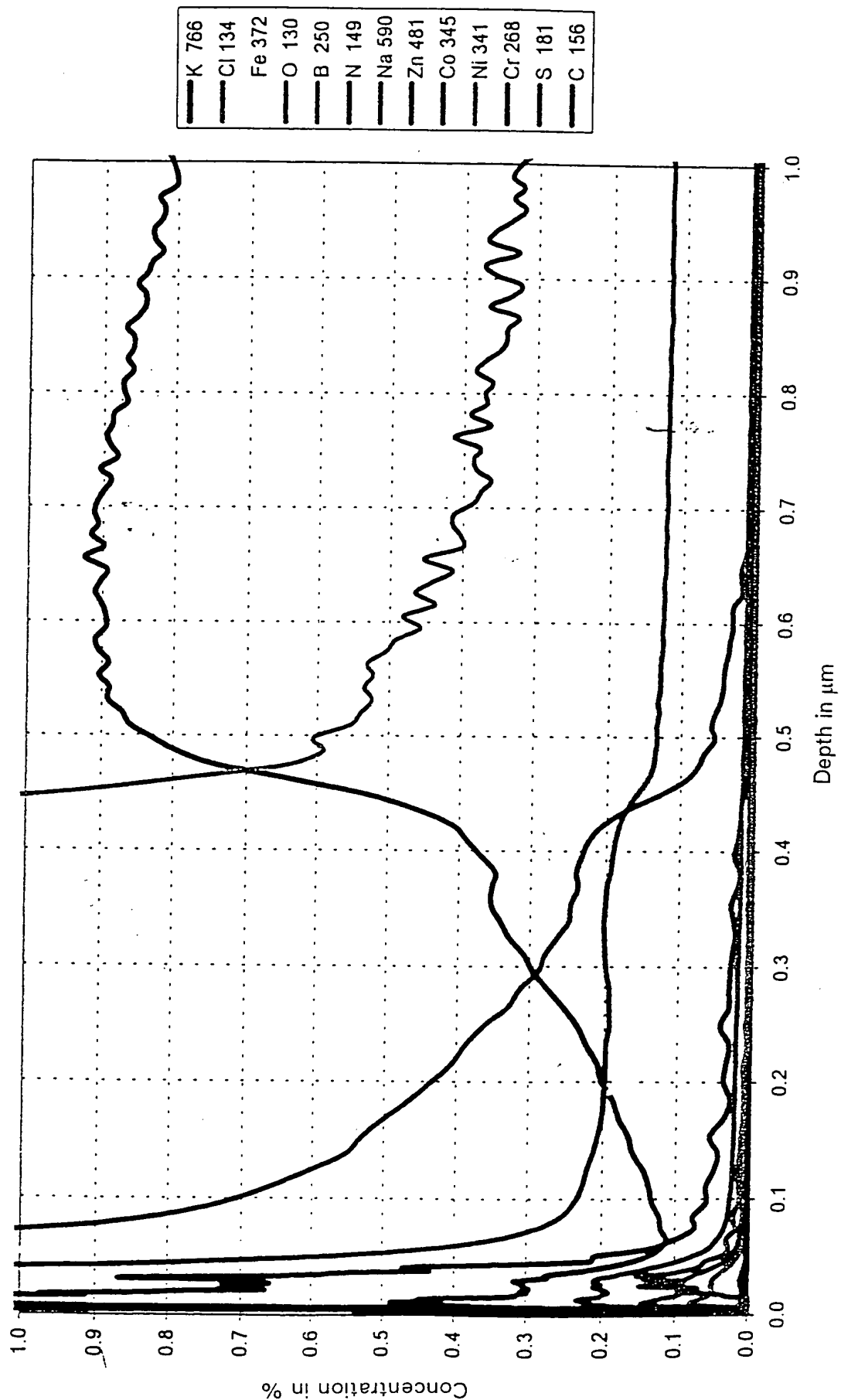
Sample 5, Measurement Position A

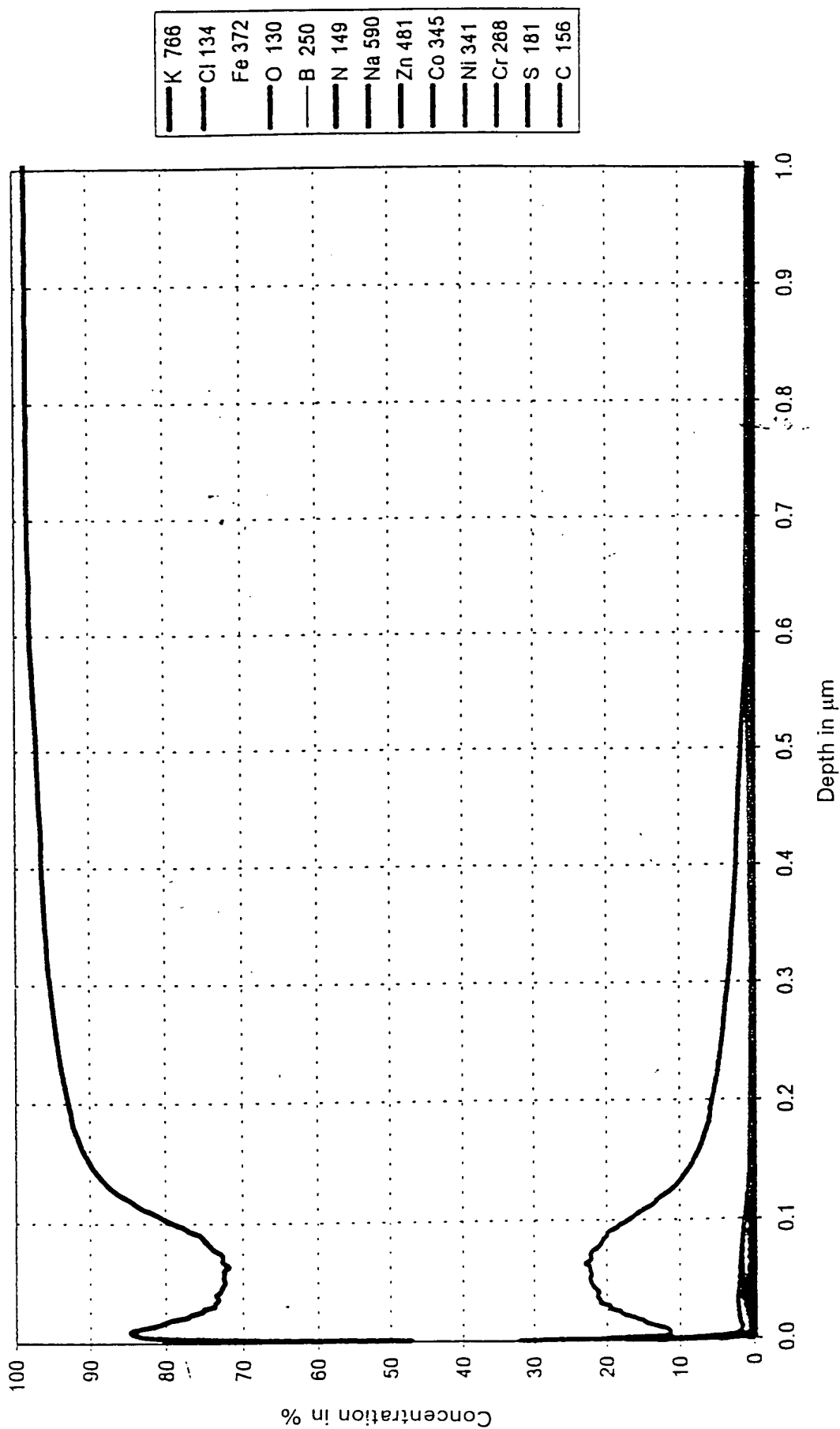


[illegible]

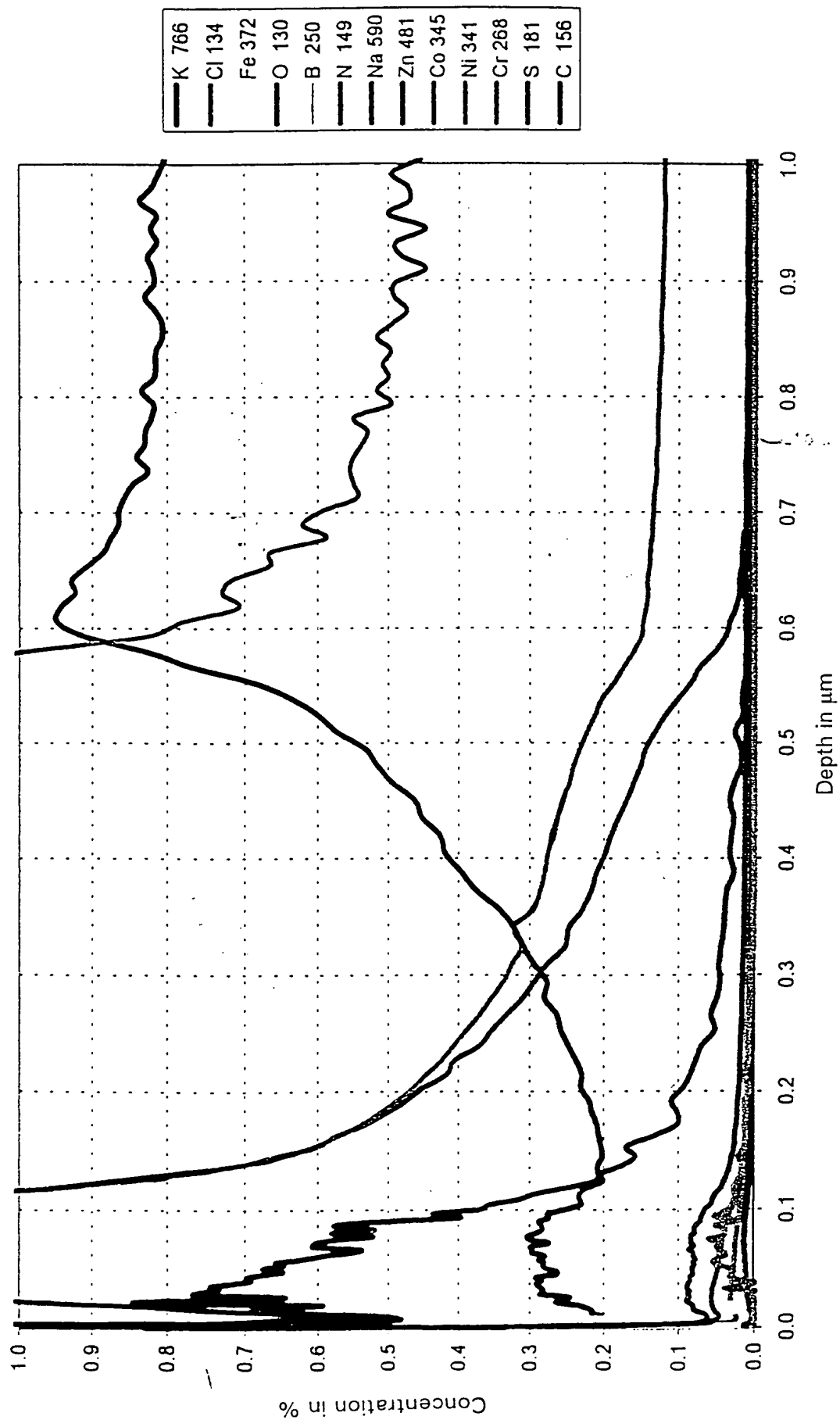
Diagram 2

Sample 5, Measurement Position A





Sample 6, Measurement Position A



Sample 6, Measurement Position B

FIG. 21

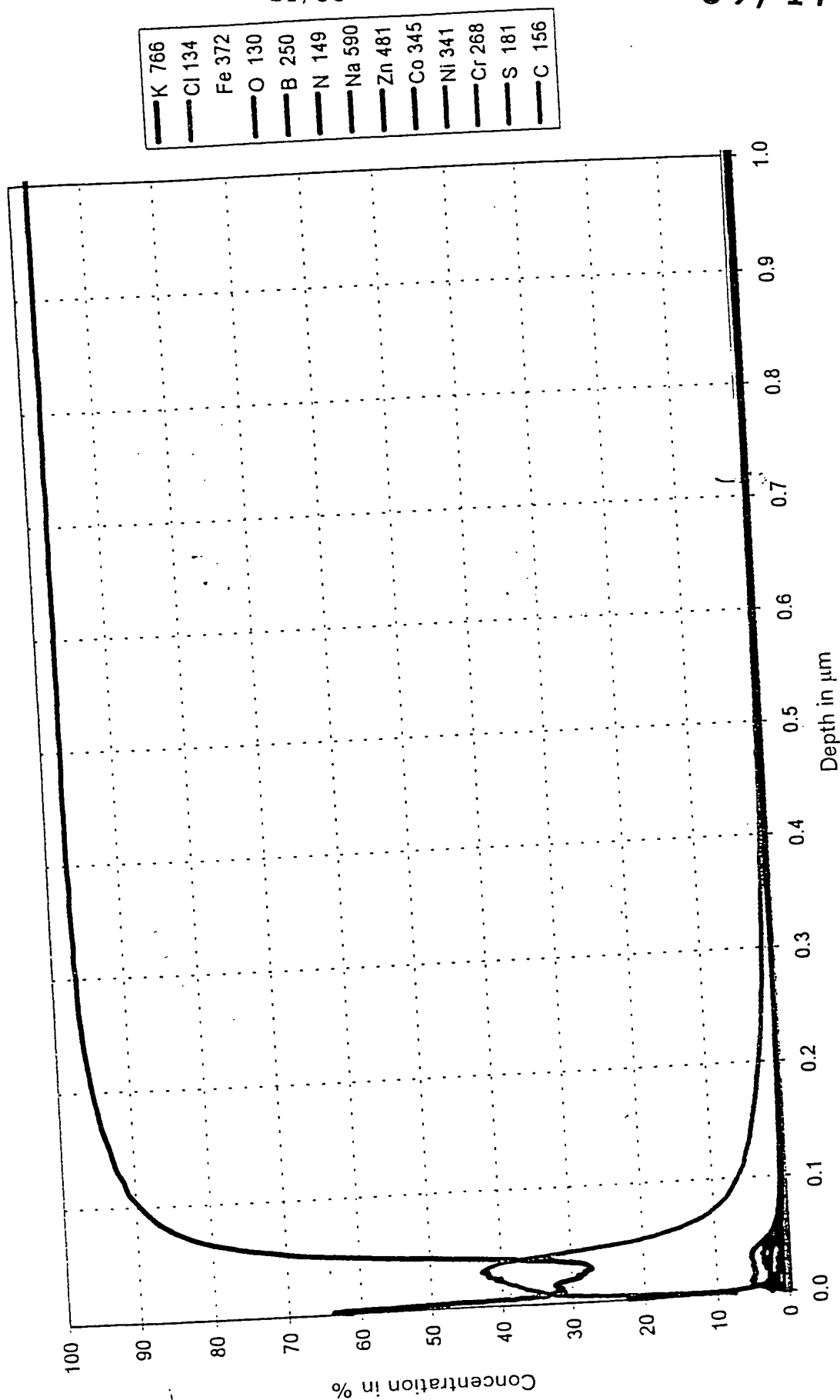
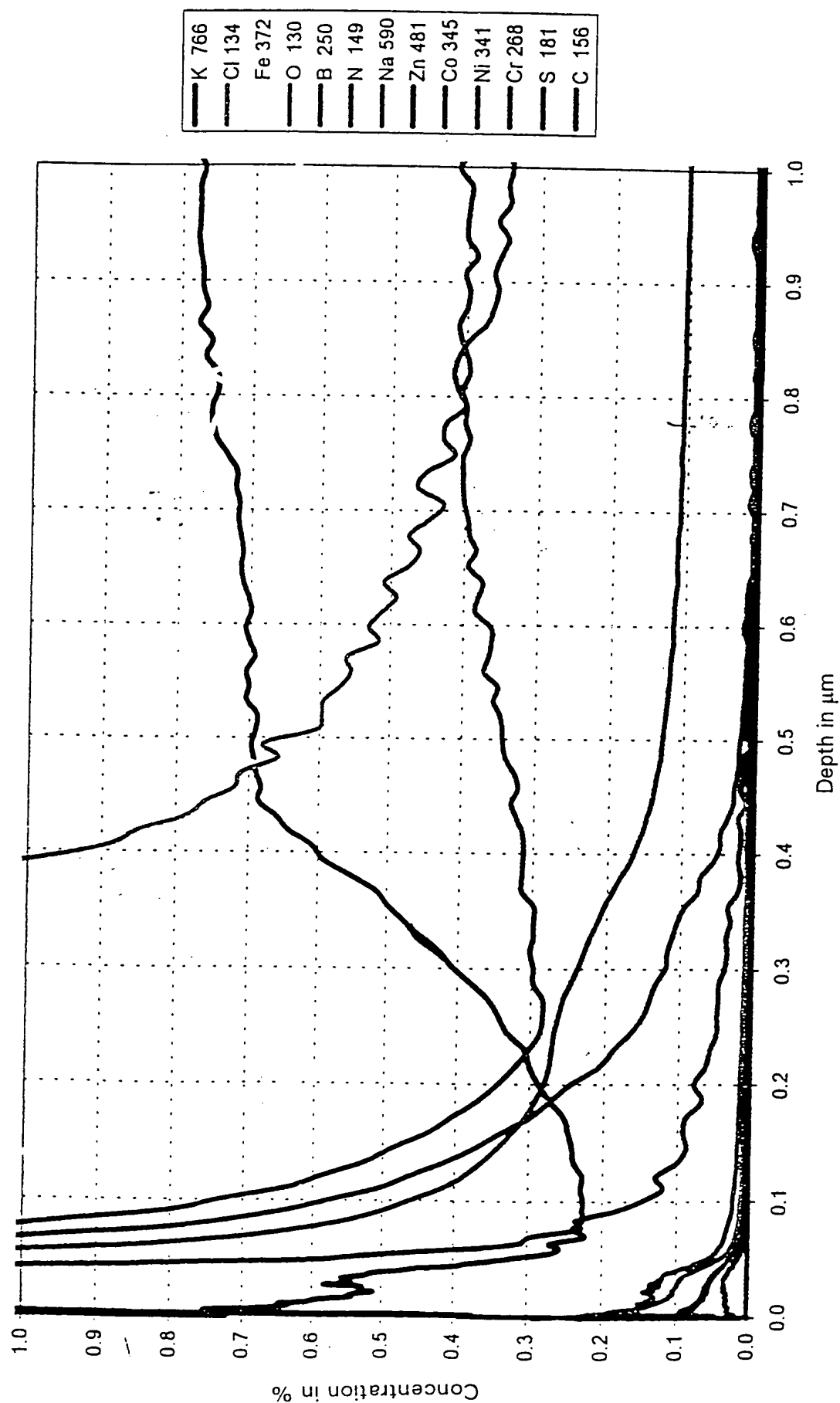
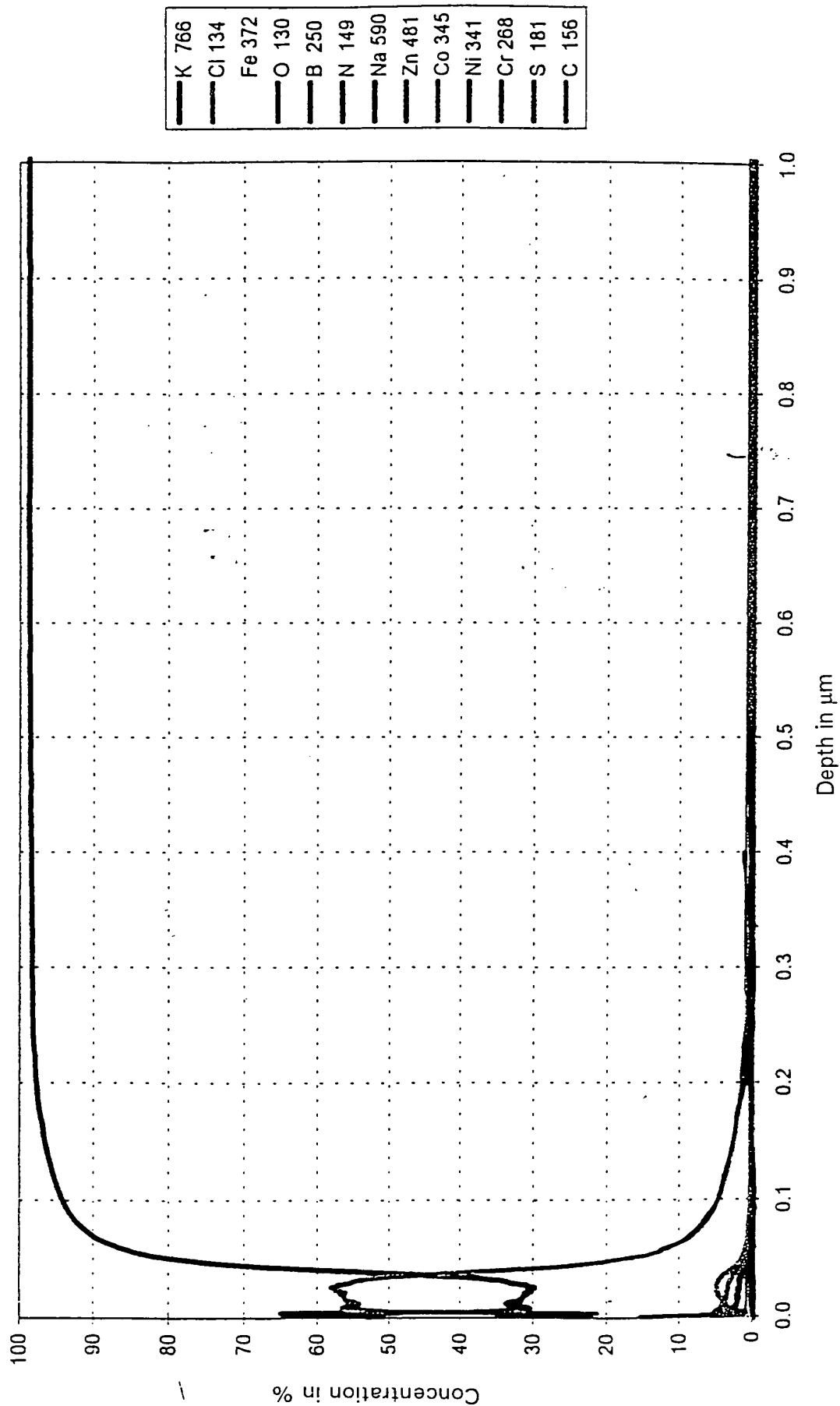


FIG. 22

Sample 6, Measurement Position B



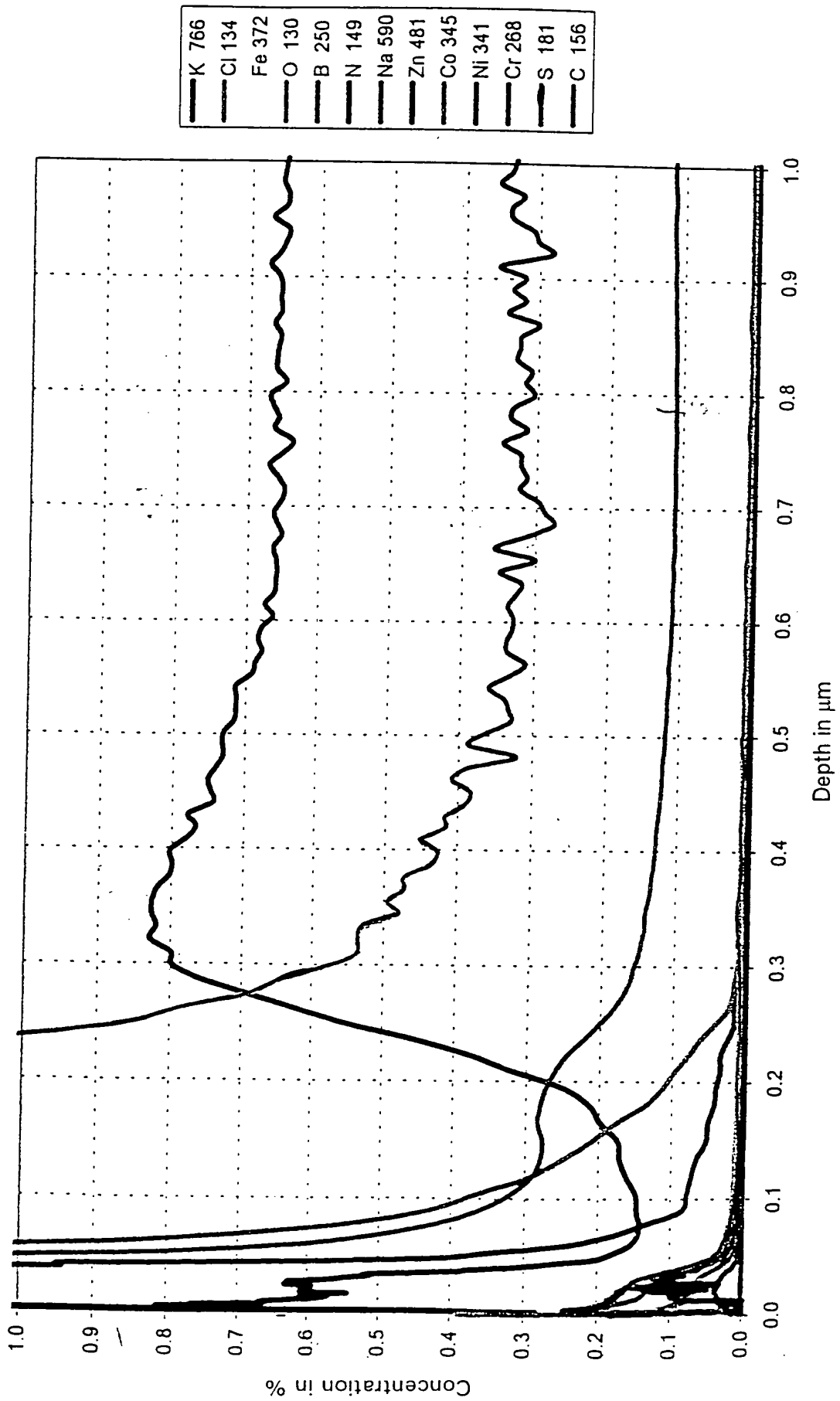
Sample 6, Measurement Position C



[illegible]

Diagram 2

Sample 6, Measurement Position C



—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

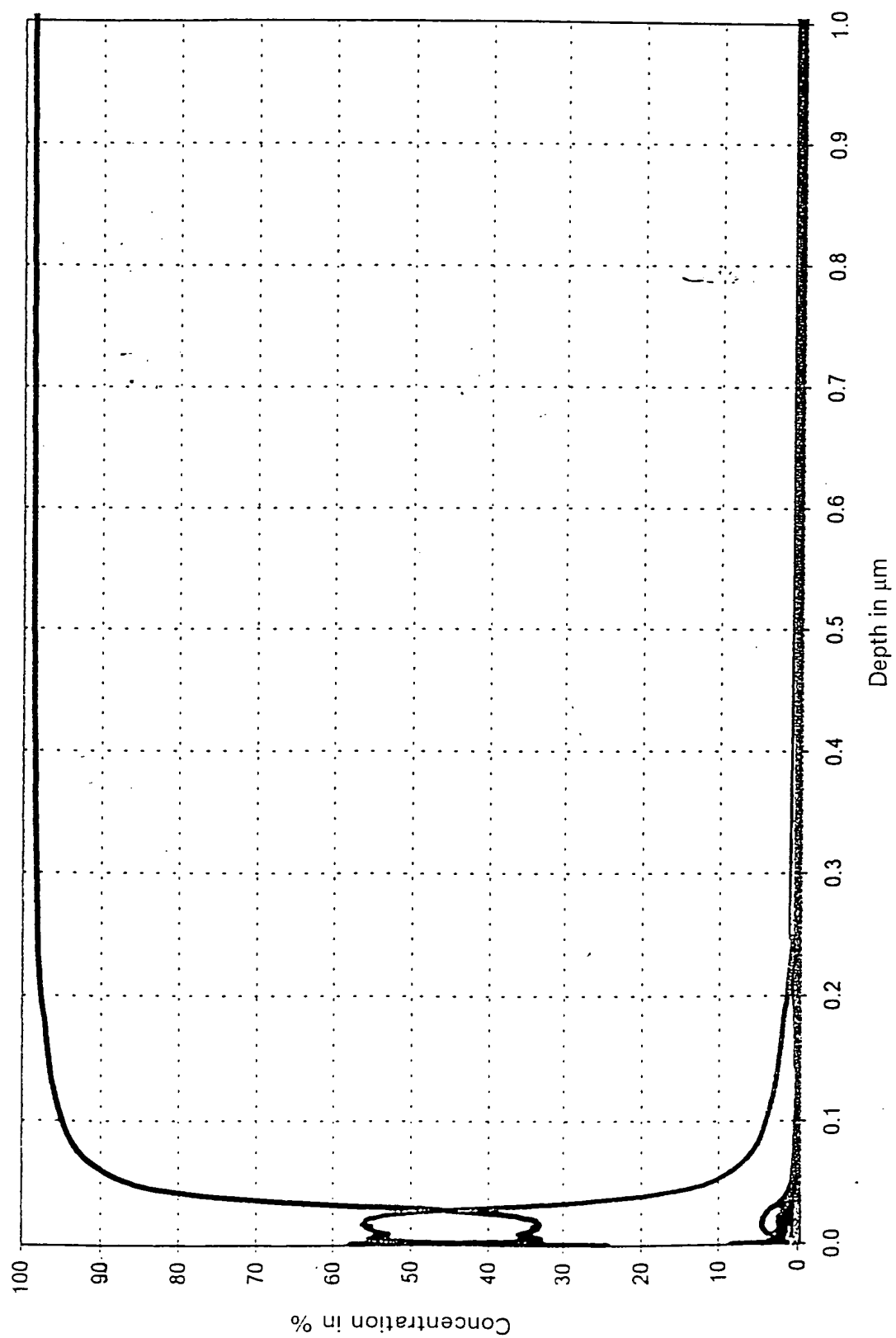


FIG. 25

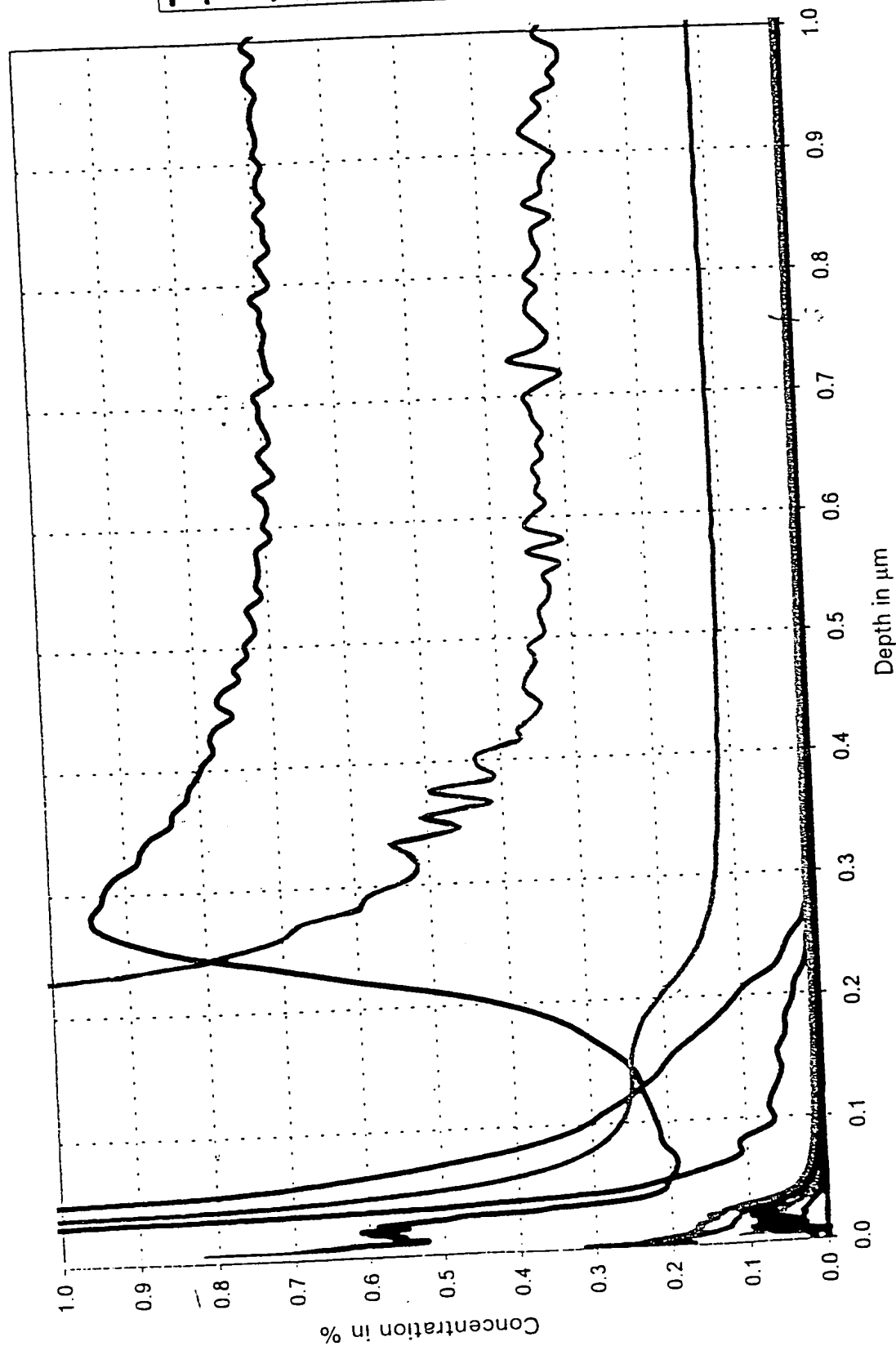
Diagram 1

Sample 6, Measurement Position D

00000 0554760

Sample 6, Measurement Position D

FIG. 26



—K	766
—Cl	134
Fe	372
—O	130
—B	250
—N	149
—Na	590
—Zn	481
—Co	345
—Ni	341
—Cr	268
—S	181
—C	156

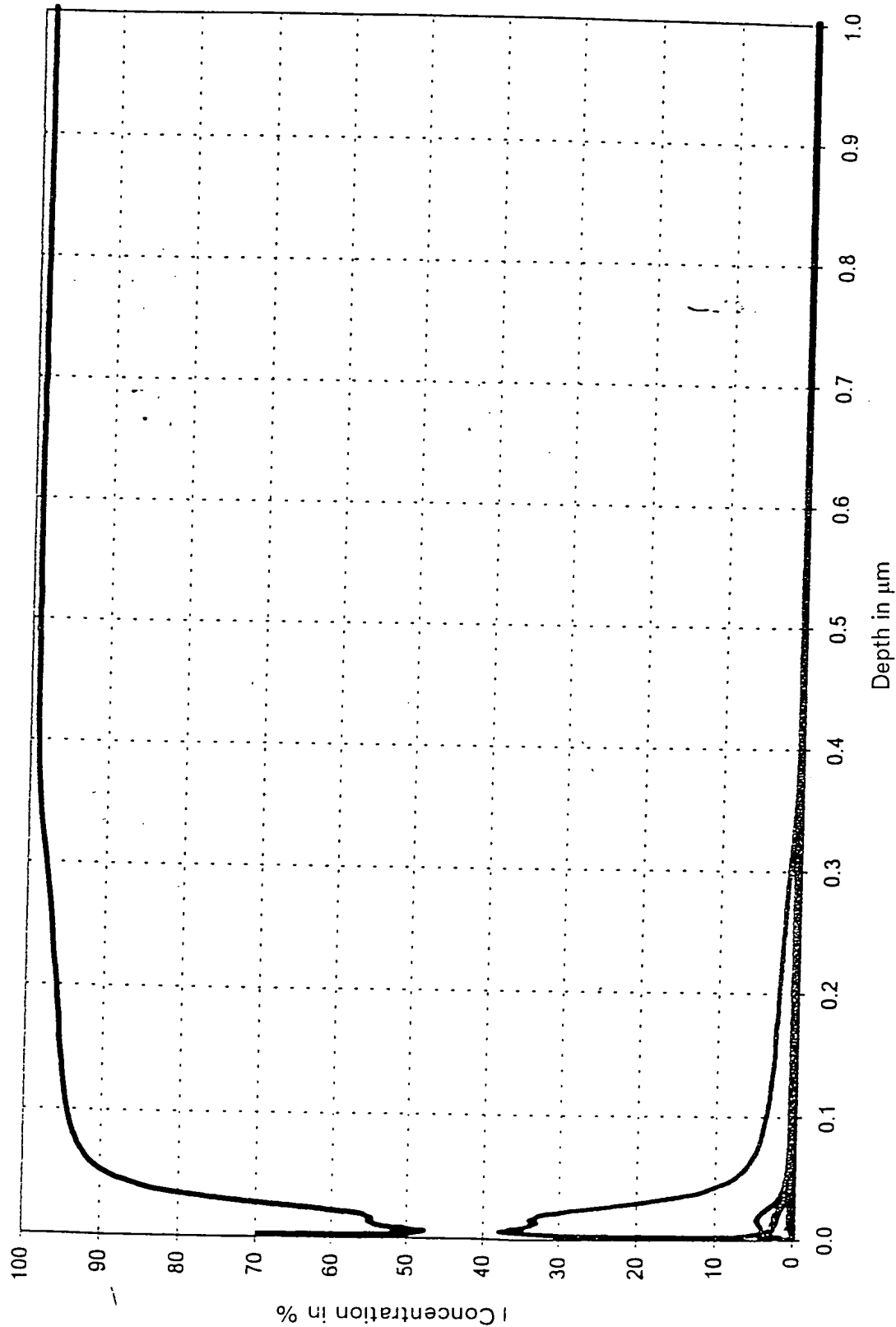


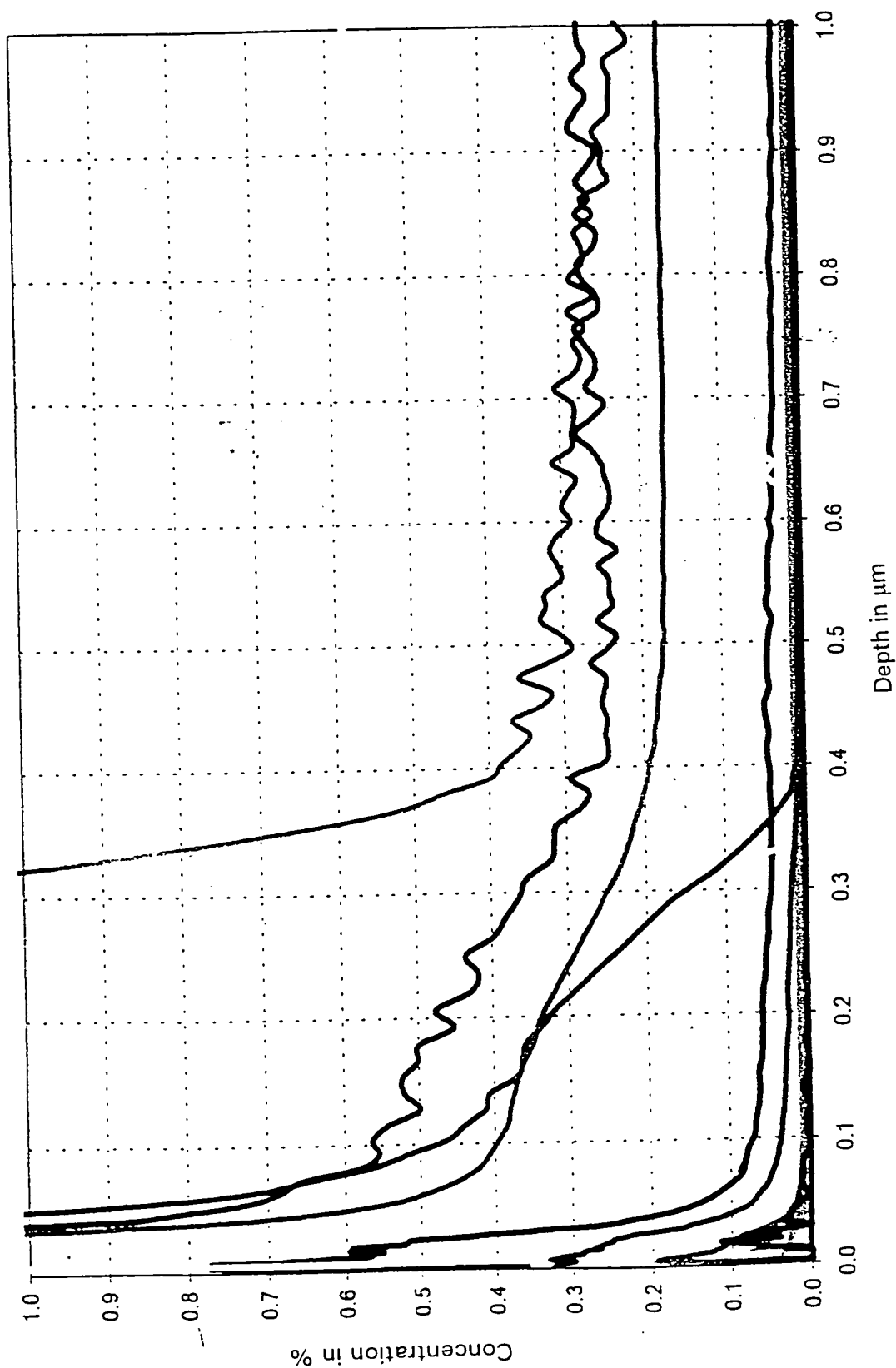
FIG. 27

Diagram 1

Sample 7, Measurement Position A

[illegible]

Sample 7, Measurement Position A



☐ K 766
☐ Cl 134
 Fe 372
☐ O 130
☐ B 250
☐ N 149
☐ Na 590
☐ Zn 481
☐ Co 345
☐ Ni 341
☐ Cr 268
☐ S 181
☐ C 156

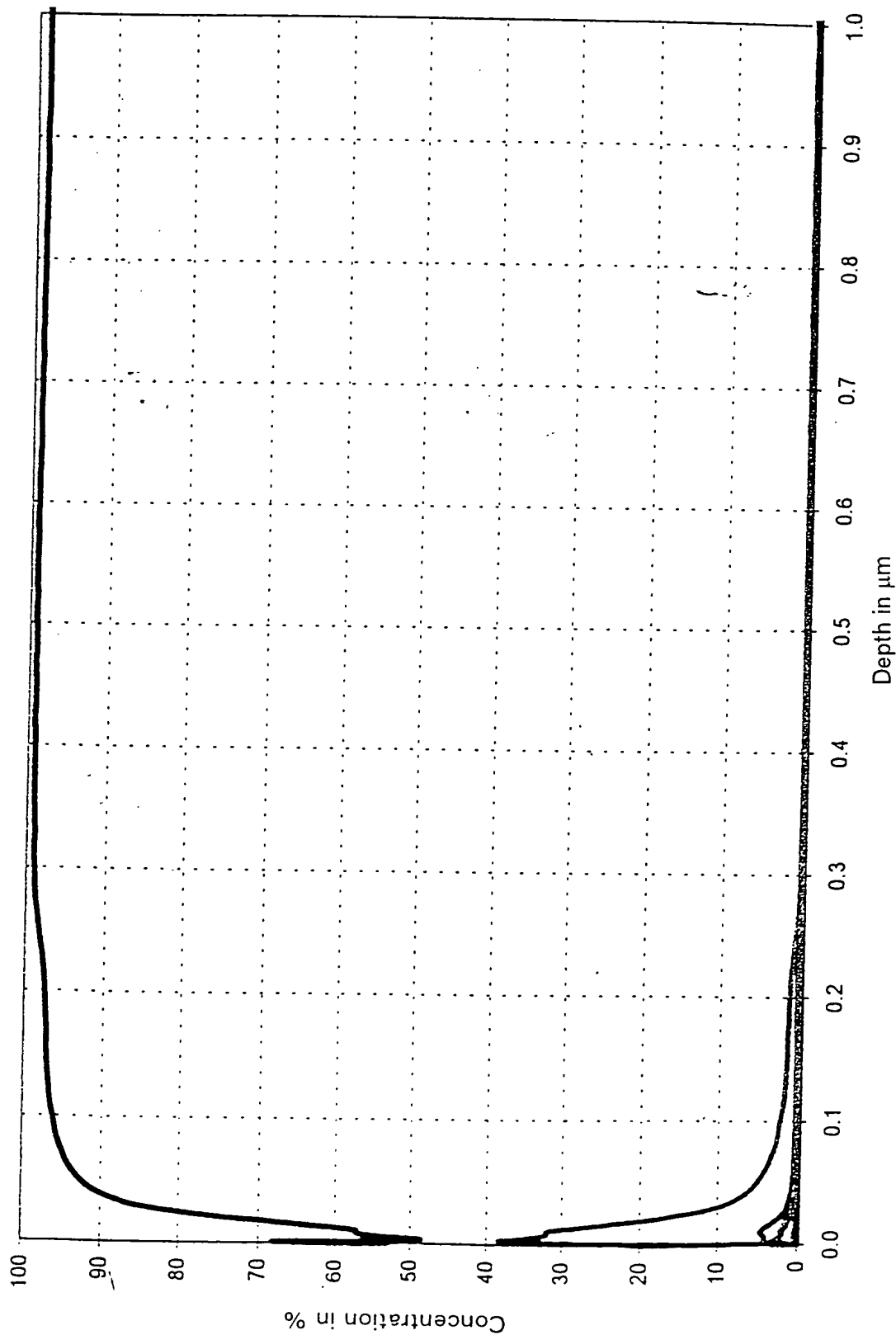


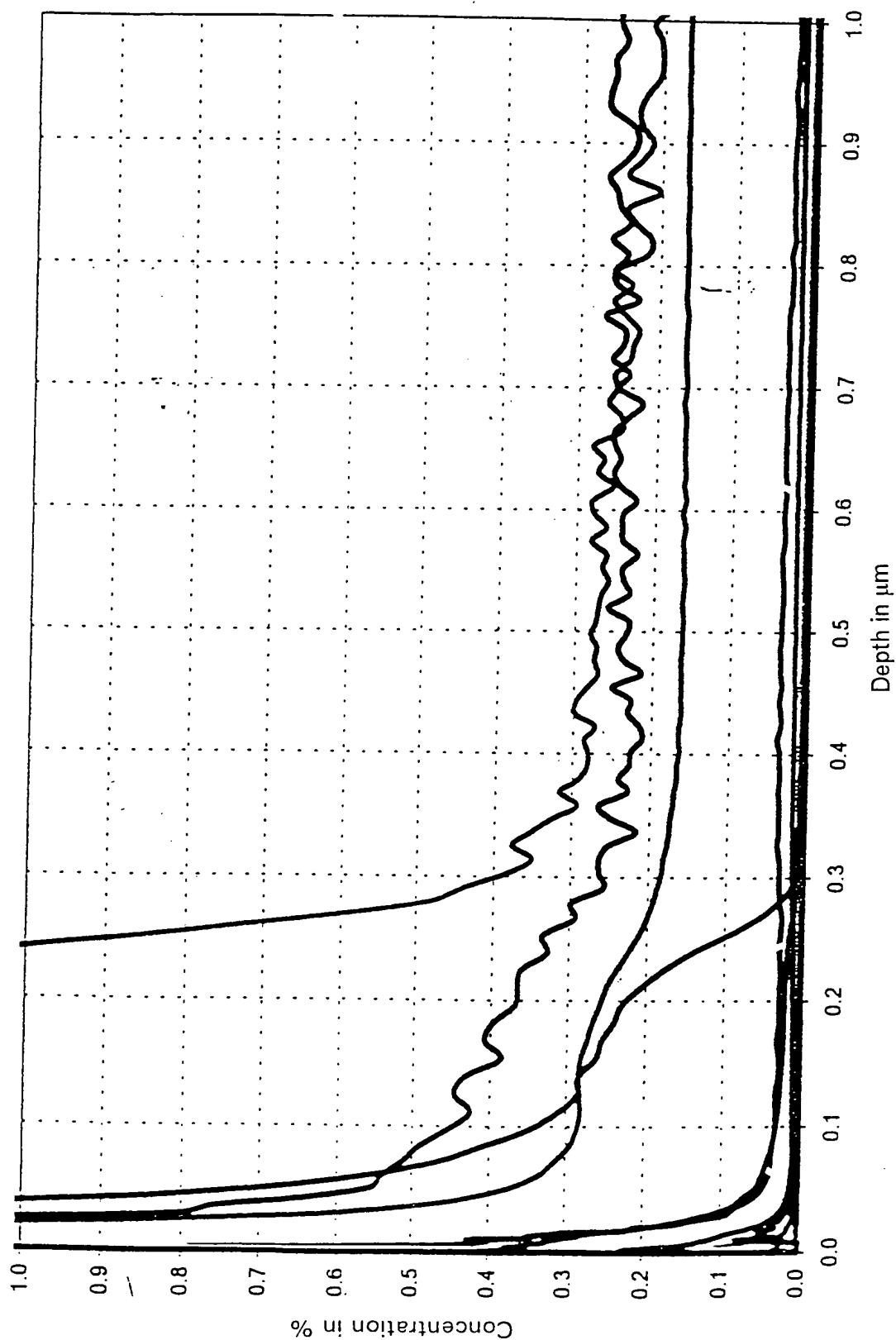
FIG. 29

Diagram 1

Sample 7, Measurement Position B

[illegible]

—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 158



Sample 7, Measurement Position B

Diagram 2

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—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

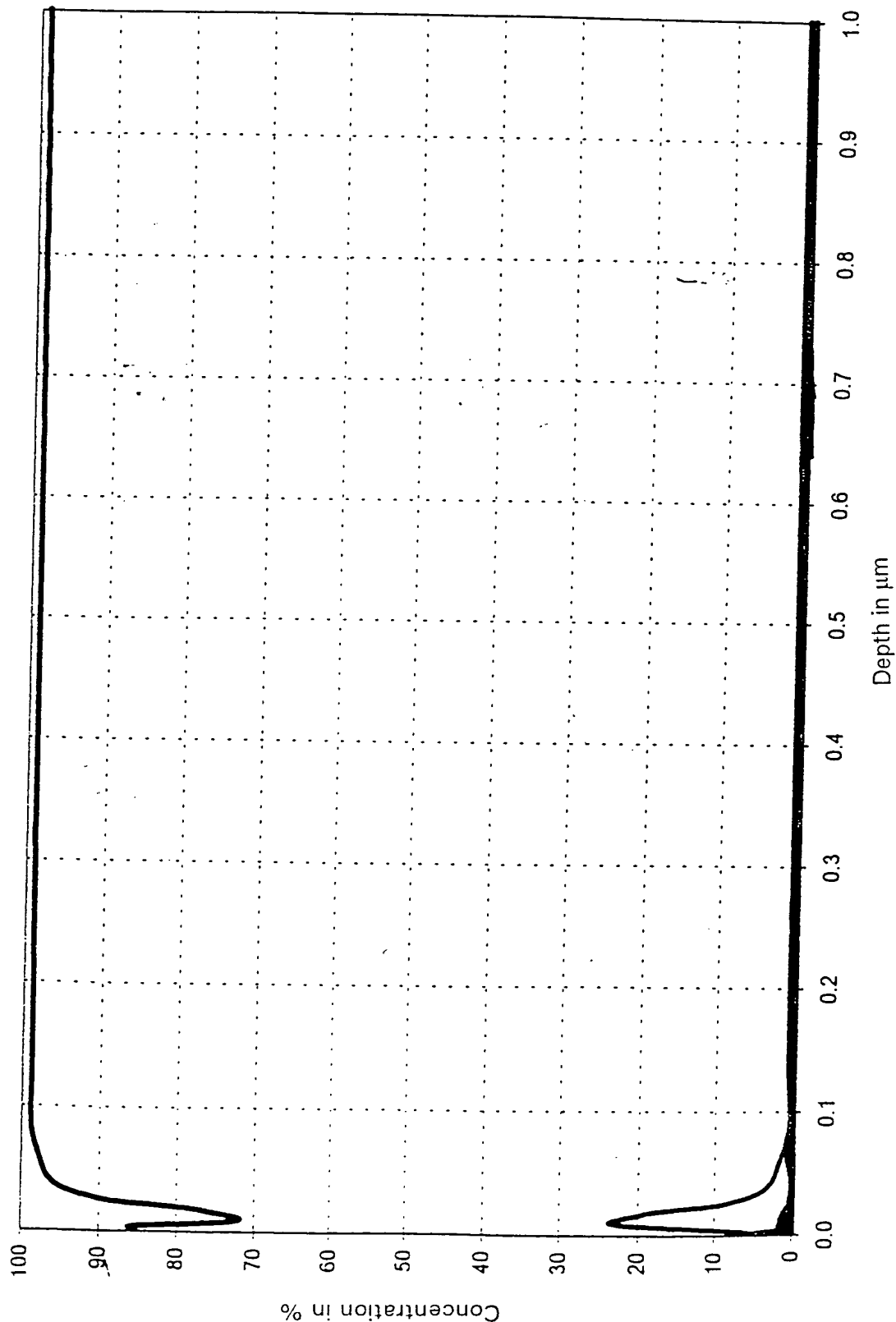


FIG. 31

Diagram 1

Sample 8, Measurement Position A

Diagram 2

Sample 8, Measurement Position A

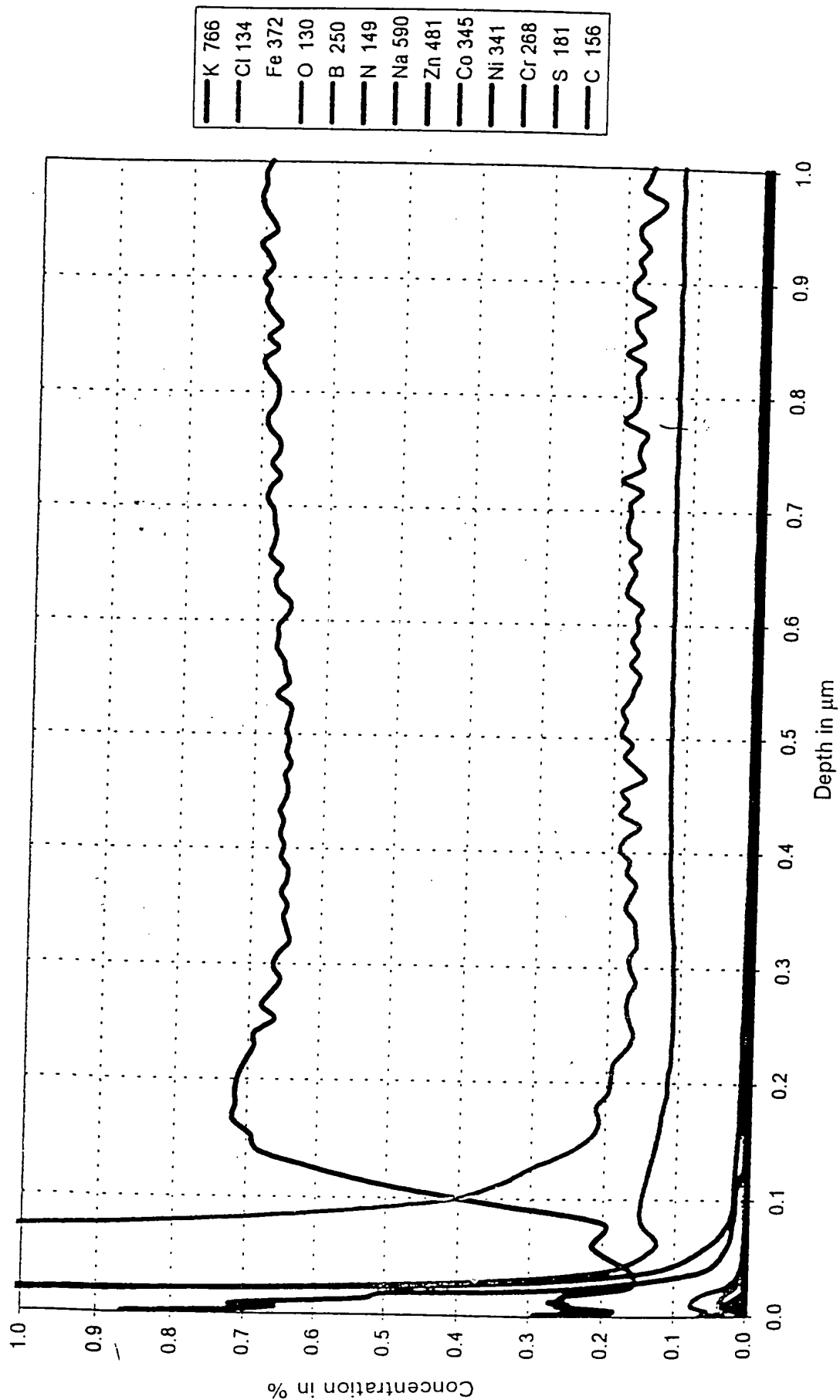


FIG. 32

—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

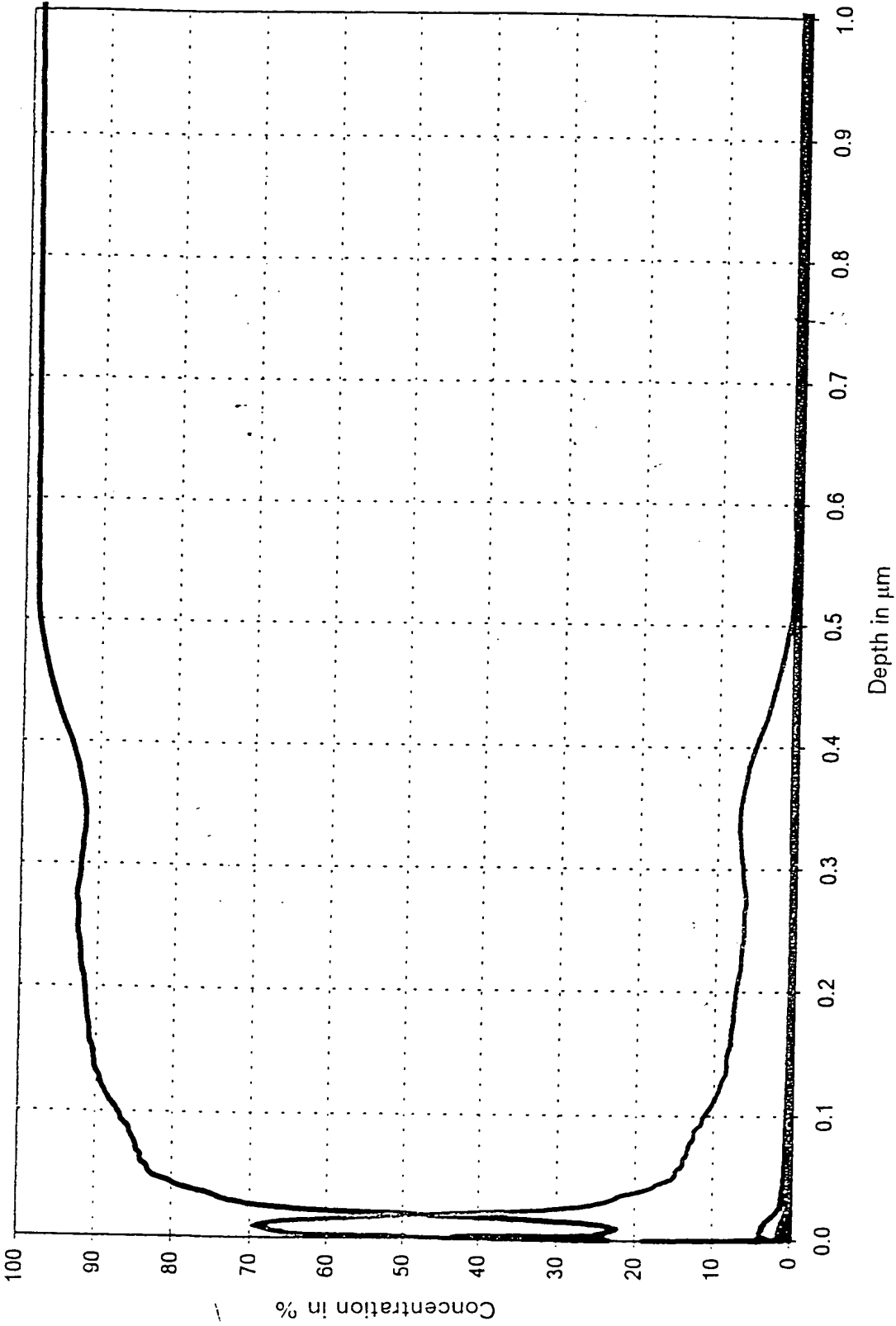
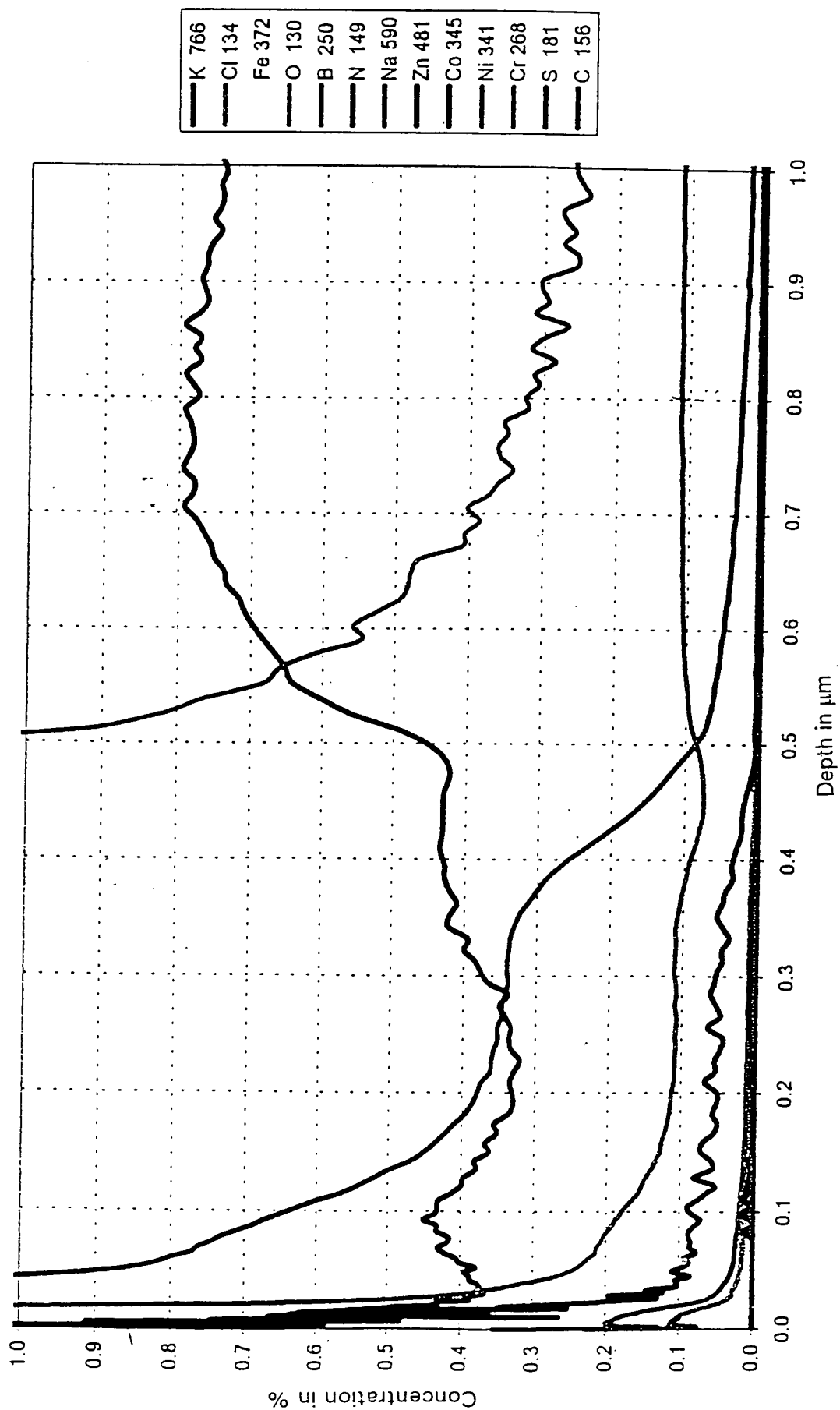


Diagram 2

Sample 9, Measurement Position A



—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

Sample 9, Measurement Position B

FIG. 35

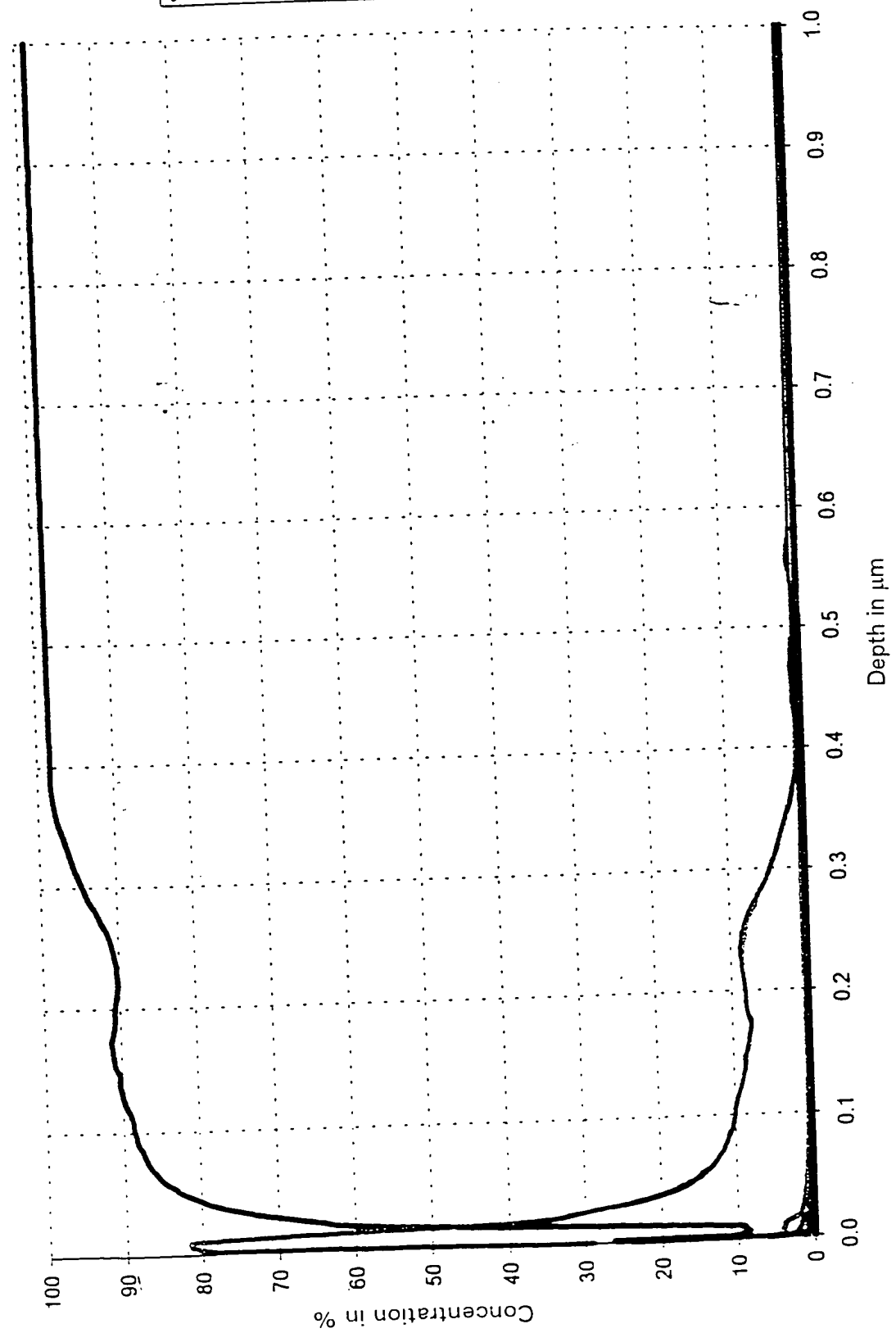
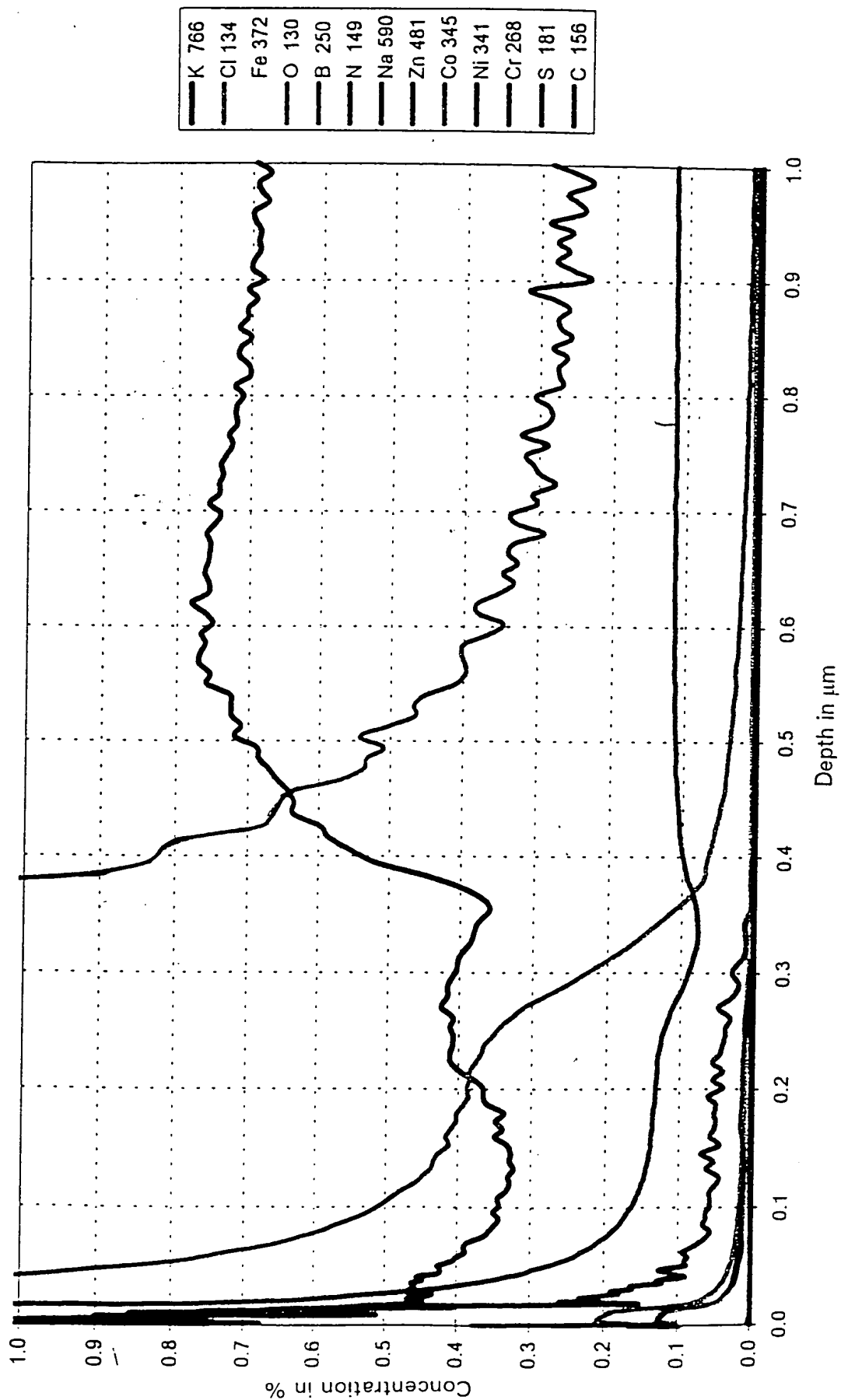


Diagram 1

Sample 9, Measurement Position B

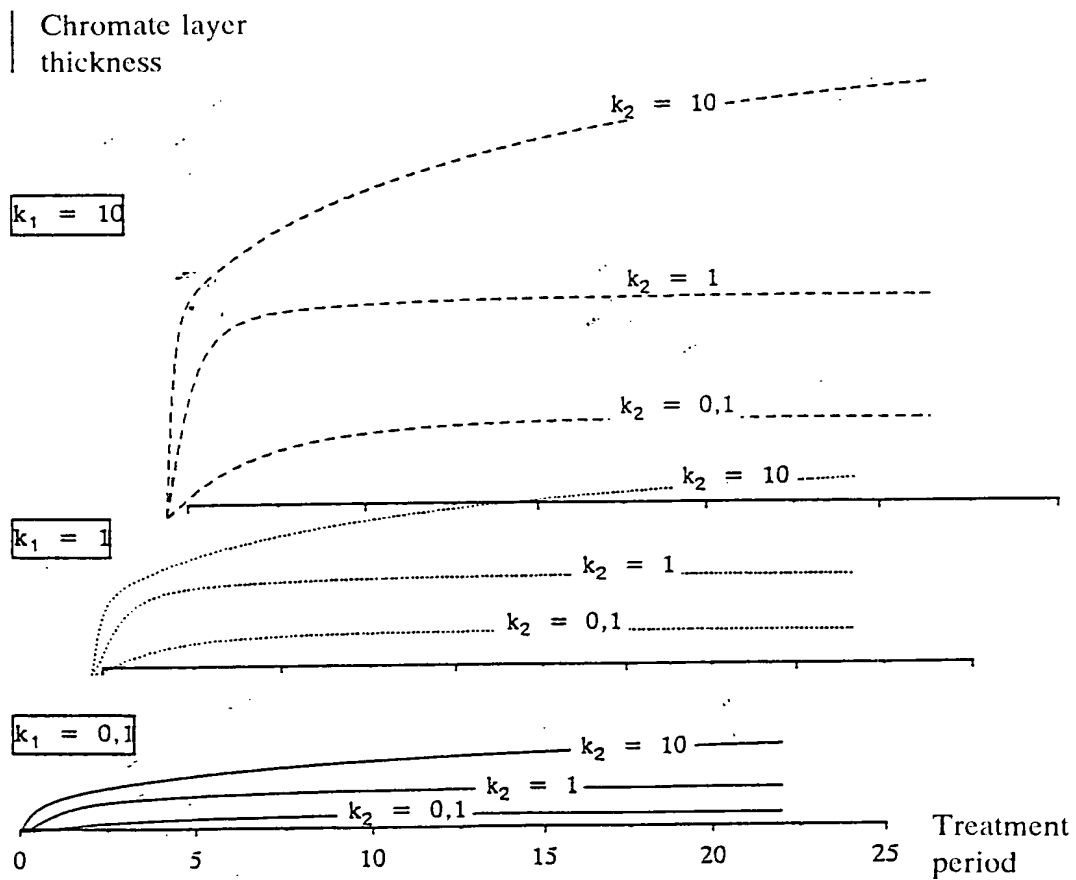


09/171558

	Methods				Sample No.
	Ellipsometry nm	SEM nm	Glow-discharge nm (Cr > 1%) with Cr (%) spectrometer nm (Cr > 30%)	chromium index nm (Cr > Zn)	
1. Prior Art					
Yellow chromation Cr(III) + Cr(VI)	-	300	440	11	9
Blue chromation Cr(III)	98	60	60	8	8
2. Invention (Chromitation)					
60 °C Cr(III)	432	300	344	7	1,2,3,4,5
100 °C Cr(III)	595	-	358	10	6
60 °C on Zn/Fe Cr(III)	-	-	282	6	7
100 °C, two-fold concentration Cr(III)	953	-	-	-	09/1

Fig. 38

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Computer simulation of the kinetic model of
chromate coating of zinc for various rate constants